THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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THE

UNIVERSAL ELECTRICAL DIRECTORY

(J. A. BERLY'S).

1908 EDITION

H. ALABASTER, GATEHOUSE & CO.,

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THE GERMAN ELECTRICAL TRADE.

A REMARKABLE report in regard to the present condition of the electrical trade in Germany has just been published by the *Arbeit Markt Correspondenz*, which is, we believe, the German equivalent of the labour organ published by the Board of Trade. Whether the report has been intentionally coloured it is impossible to say, but it is so extraordinary as to demand the attention of the trade in this country.

The newspaper states, in the first instance, that the electrical industry has only been slightly affected sympathetically with the industrial retrogression. Whilst the degree of employment in, and the market situation of, most trades are unpleasantly represented, the electrical industry rather shows a slight revival and both sales and prices are satisfactory. The condition of the labour market is certainly depressed by a greater pressure of applicants for work, but the number of employed is even higher than in the previous year. The favourable shaping of inland sales arises for a large part from the circumstance that the large industrial establishments are utilising the present period for the execution of extensive improvements in working, which variously consist in a greater use of electric power. This is especially the case with the mines, ironworks and rolling mills, and also in the textile industry. The erection of power stations in agricultural districts, and the connection of numerous localities and works with these stations, are likewise on the increase.

The principal branch of the industry—the construction of dynamos, motors, &c.—has consequently exhibited a satisfactory development in the course of this year. If the degree of employment in some of the smaller works has transitorily declined because home requirements have been restricted, the opportunity for work in others has become more abundant. Where the latter lacked inland orders, they have had far more to do than in the previous year for account of Italy, Austria-Hungary, Great Britain, Belgium, and Spain. This point is illustrated by the following figures of the exports in the first six months of the two years:—

First half of—	1908.	1907.
Dynamos	13,460 tons	8,802 tons
Cables	1,719 tons	—

The dynamos comprise machines of all weights, and the export prices in part have been higher than formerly. The weight of the cables for the first half of 1907 is not given, but the value for the corresponding period in this year is stated to be £150,000 greater. Chile in particular increased her purchases of cables, the exports thither having advanced from 57 tons in the first six months of 1907, to 180 tons in the period of this year. A larger tonnage has also been furnished to Sweden, Denmark, and Belgium, but the requirements of Great Britain and the Argentine were curtailed.

The demand for electric lighting articles has not been so brisk inland as in the previous year, this being attributed to the diminution in building activity. It has, however, been

possible to find partial compensation in larger sales abroad, as both the quantity and the values have experienced an augmentation. The telegraph and telephone works have only had to complain in isolated cases of difficulties in effecting sales, there having been further overtime worked in some instances. The crisis in the automobile industry has unfavourably affected the demand for electric motors in those works which have taken up the former branch. The explanation for the maintenance of prices on a remunerative level is mainly due to the understanding between the large works, which has almost abolished competition in the securing of orders, but which has prejudicially affected the works of average or small dimensions.

The foregoing statements will scarcely form pleasant reading on this side of the Channel. It is certainly a fact that competition, even for orders of the value of £1,000, has been largely eliminated by means of a thorough commercial organisation throughout the country. If a loss is incurred in securing one order, recoupment is obtained on another, and thus the business taken altogether is maintained on a profitable basis.

AMERICAN TROUBLES AND THE ELECTRICAL TRADE.

The era of financial turbulence and panic with which the United States has been disturbed, naturally had a serious effect upon American electrical industries. We gather from the New York *Electrical World* that the electrical exports from the States during the 11 months ended with May indicate totals "quite a little" below those of 1907, unless the June figures, when published, reveal "a great and unexpected rally" in that month. We recently saw it stated that the business of the American Westinghouse Co. in June was 15 per cent. better than that done by it in May, the new orders being unusually large and numerous. Probably these include a good deal of work that had been arranged for some time ago, but which was deferred when the panic came. For the month of May and for the 11 months, the declines under these two headings were as follow :—

	Total May, 1908.	Decrease compared to May, 1907.	Decrease for 11 months.
Electrical instruments ...	$619,393	$155,279	$1,175,879
Electrical machinery ...	$800,566	$331,478	$89,084
	11 *months*, 1908.	11 *months*, 1907.	—
Grand total	$14,218,207	$15,433,170	$1,214,963

From these figures it will be seen that in the electrical machinery section the fall for the month of May is about three times greater than the aggregate decrease for the 11 months; presumably in earlier months there were substantial increases as compared with the year 1907.

After pointing out that most of the decrease might perhaps be said to be due to the difference in the value of raw copper alone, our contemporary proceeds to show that it does not take an at all despairing view of the position and prospect, but in the belief that with returning prosperity the old levels "will be reached and soon excelled," it tries to administer a tonic to the electrical manufacturers of the States by urging them to see the wisdom of an energetic policy that will build up a "sea-borne trade," desirable at all times as increasing the volume of product and thereby decreasing costs, and it adds, "also as an outlet for surplus goods in the recurring seasons of depression." We venture to believe that it would do some of us on this side of the Atlantic good to catch more of the spirit with which this advice is inspired. The alleged reluctance of some of our manufacturers to plunge properly into a study of the electrical requirements of the world, their rocking to and fro in grief, their squeeze-one-another-at-home weakness with its consequent undercutting, their displeasure at the necessity that compels them, as was said not long ago, to look abroad for work, are matters for surprise and regret, and they are the fruit, to some extent, of a disposition which never will mend anything that may be wrong either in the matter of foreign competition or in connection with the surplus electrical manufacturing capacity of the country. The other day, when in conversation with a representative of one of our largest electrical trading and manufacturing companies, concerning the present position of the electrical trade, our companion remarked, "Well, things *are* quiet—these are the months when one expects them to be so—but I find that bad as things are said to be, everybody seems to be able to go for a holiday." It may be true that some men are able to get away because trade is quiet, but there are others who in quiet times prepare campaigns for active operations. No doubt there are plenty of electrical men who at this moment are busily engaged with plans for the better trade that they look for in the late autumn and in the winter.

We trust that the efforts of the British manufacturer will be centred more and more upon developing this "sea-borne trade" which our American cousins regard as a desirable thing at all times, whatever may be the circumstances and conditions which make it necessary. It is a kind of business which pays no heed to the fact that we have a holiday respite in the summer months. It might, if properly sought for and encouraged, even make it inconvenient for the summer vacation to be so easily taken. A sort of geographical distribution of business in different markets, ensuring something all the time from somewhere! That may appear to be too fanciful an ideal on paper, but it may be worthy of more attention than it receives. It will never be secured in any particular degree unless a determined effort, perhaps involving temporary sacrifice, be made. A complaint that responsible officials cannot be spared to go in search of foreign business seems to us a lame excuse for lack of foreign enterprise. It is a reflection upon the management that delivers itself of such an utterance—a confession of inefficient organisation. Do the wheels stop turning when leaders take an extended holiday?

Our contemporary delivers some comments on the new Patents Act of the present Government, which are so interesting that we reproduce them in full :—

> It will be interesting to see the effect on export trade of such patent laws as have recently been instituted in England compelling a patentee to "work" in that country in order to keep his rights alive. Possibly we may run into an era of retaliatory measures of this kind that will in the end lead to the abrogation and nullification of such laws; but meantime it looks as though American articles protected in England by patents will also have to be English in actual manufacture. We have already given some details as to this important legislation, but as it does not go into effect until the end of the present month, no one can yet say just what the effect will be. But at first glance, it does look as though a check must be administered to patent articles; though, again, it will not be altogether easy to discover for some time what that means. Most electrical experts, we imagine, rest for their market and their customers, less on patent protection than on quality, cheapness and intrinsic desirability.

Gas Turbines. INVESTIGATIONS into the potentialities of the gas turbine are in good hands and are being carried out with systematic thoroughness. It is early yet to hope for the ultimate development of an oil engine of turbine form, but the great convenience of such a machine is evident.

The development of the idea into a machine which will actually turn has been done years ago, but the modern machines are of considerably more practical form than the one at South Kensington. The experimental apparatus referred to by Prof. Belluzzo in his article in *Zeitschrift für das Gesamte Turbinenwesen*, probably the latest information on the subject, follows the lines to be expected, but follows them with care and foresight. The apparatus is provided with externally driven gas and air compressors, with the aid of which the mixture is consumed in the turbine on the Diesel principle. The results obtained are compared with those of an "explosions turbine" to the advantage of the former. The explosions turbine is not described in the article, and it is possible that the details are not yet made public. The existence of such a machine, however, is something. The article in question concludes with the opinion that the gas turbine is now in a position to take the field, under suitable conditions, with the piston motor as regards thermal efficiency, if the efficiency of the compressor is not under 75 per cent., and that of the turbine not under 70 per cent., and if one aims at a single expansion in a de Laval wheel.

Things to Know about Coal. WHAT should a manufacturer know concerning coal? According to Mr. E. G. Bailey, of the Little Laboratory, Boston, U.S.A., in a paper read to the Cotton Manufacturers' Association, he should understand how to store coal if he be far from its source, so that he may not be left short. It is concluded that underwater storage alone will preserve coal from wasting by oxidation. Sulphur is regarded as the agent by which a pile of coal becomes overhot; yet 1 per cent. of sulphur, if completely oxidised, would only heat a coal pile 200° F. if there were no cooling by radiation. But coal with less than 1 per cent. of sulphur often fires spontaneously. Heat in a pile of coal appears to be very fortuitously located. A deep pile may be hottest only 3 ft. from the surface, or it may be hottest deep down. The heat generated really arises from oxidation of the coal itself, and the rate of air circulation seems to have much to do with oxidation.

The author, apparently, can suggest nothing, but it might be pointed out that coal should be stored in large sheet-iron air-tight holders like a (square) gasometer. Shut off from fresh air, it could not heat by oxidation, especially if the holder were charged with CO_2 admitted by a pipe into the very heart of the coal after sealing up, so as to displace the air by a vent, afterwards closed, at the roof.

Then the coal to be used must be one that can be burned fast enough to raise the necessary steam. Coals—perhaps not in Great Britain to any extent—will sometimes be of a nature to burn so slowly that the necessary heat cannot be got out of the available grate area.

It is not always the highest priced coals that give the best results; indeed, it may usually be said, as regards Great Britain, that the cheapest coal that can be used will be found to give the most economical results. Cheap coal is so very usually small coal that it is difficult to burn only because of its smallness. It is often very good calorifically.

Of course, within the possibility of burning enough to do the work, the author rightly says that the value of a coal is expressed by its heat unit value per unit weight. But, as he says, there are various limitations to this general statement, brought in by smoke production, ash removal, and the liability to spontaneous combustion where a store is required.

Every manufacturer should, of course, be guided by his own circumstances. Thus, at the present moment, when Lancashire boiler makers would supply him with a new boiler at an unfairly low price, there must be many manufacturers who could, by putting in an extra boiler, place themselves in a position to make very good interest on the investment by the saving they would make in the reduced price of the fuel they would use when better supplied with grate area.

It is important to watch that the merchant sends coal which is up to original sample. The analyses published by coal companies are by no means to be depended upon as representing average values. They are usually from picked samples. If a coal company knows that its product is being systematically watched and analysed, this fact will tend to maintenance of quality or to a more ready acceptance of a price varying with calorific capacity. Some American power stations have very elaborate forms of coal contract sheets devised with a view to the receipt of a proper allowance of thermal units potential. Especially is it necessary to regulate price on this and an ash basis, or the user may find he is getting heat at the expense of too much ash cartage. The calorific capacity of any fuel is reduced by about 1,200 B.TH.U. for each pound of water it contains, apart from the actual missing fuel of equal weight.

But ash is considered by some authorities to have a further effect than that merely due to inert matter. It is considered to lower the efficiency, presumably because it may cause a too heavy influx of air between the fuel particles, for it is not easy to see how it can reduce the calorific capacity of the combustible elements, though it would certainly reduce efficiency if it allowed an excess of air and thereby reduced the furnace temperature. Then ash may be costly to cart away, or it may even be sold, in which case its presence is of less importance, though, of course, its carriage has already been paid for as though it were coal.

Copper. AN article in the *Financial Times* remarks on the upward tendency of the price of copper at the present time, in the face of abnormally large stocks and visible supply. The writer of the article in question is inclined to attribute this phenomenon to the influence of recent heavy buying, apparently on American account. Arguing from this that limited production is beginning to make itself felt in America while Europe is innocently living on stocks, we have a simple explanation. "The main danger of the position at present," says the writer further, "is a relapse of the European demand before the American consumption has regained its normal dimensions." This infers that American consumption is low, and consequently, the rise due to scare.

Practically, the situation appears to be that the speculators foresee a trade revival, and commence to acquire stock and futures in anticipation of and by way of assisting it. Persistent rumours of limited production go to help this, and the result probably will be the holding of stocks and consequent rise in prices. If the consumer is in such a position that he can leave the market to speculators for a short time, nothing serious should result. But these movements very soon affect an unstable market like that which deals with copper.

At the time of writing the market has again settled more to normal. Messrs. Merton's report for mid-August is certainly reassuring. Stocks in England and France have risen 2,000 tons, and those afloat from Chile and Australia are not diminished. French stocks of fine copper show a similar increase. The total visible supplies reach the imposing figure of 44,785 tons. At the present rate 50,000 tons would seem a not unattainable figure. After two years of an average 12,000, this figure indicates a most unusual condition of things.

Deliveries are less, as well they may be, with so much material on the spot. The whole tone of the statistics seems to be that very little buying is taking place.

D

CONDENSER ACTION OF SYNCHRONOUS MOTOR.

By M. G. M.

It is well known to engineers connected with alternating-current work that a synchronous motor is capable of drawing a large leading wattless current from the mains, provided it is sufficiently over-excited; therefore it is very obvious that it may be employed for the purpose of improving the power factor of a circuit, the machine acting as though it possessed capacity. In many large manufacturing towns a power factor of 70 per cent. is by no means uncommon. This may be due to a number of induction motors running only partly loaded. Now, the effect of these lagging currents is to demagnetise the field of the alternator, thus causing a very large drop in P.D., in addition to limiting the capacity of the machine and mains. It is, therefore, self-evident that the efficiency of the whole plant is very much lowered. I shall endeavour to show graphically how the rating of a synchronous motor* may be calculated.

First, let us consider the case of a 1,500-K.V.A. set working at 70 per cent. power factor.

Power Factor Raised to Unity.—Fig. 1 shows the conditions that exist. A B represents the 1,500-K.V.A. load; A C the true power, 1,050 KW.; and B C the wattless component, which is

$$\sqrt{(1{,}500 + 1{,}050)\,(1{,}500 - 1{,}050)} = 1{,}071.$$

Now, in order to raise the power factor to unity, we must introduce into the circuit a leading wattless component equal to B C; this is represented by C D. I shall assume that the true input of the motor is 5 per cent. of its wattless component (54 KW. approx.); therefore the rating of the motor installed must be

$$\sqrt{(1{,}071)^2 + (54)^2} = 1{,}072 \text{ K.V.A.}$$

It will be seen that the motor is very large, compared with the gain in plant capacity.

It is not always economical, or even desirable, to raise the power factor to unity. Let us consider the above circuit increased to 95 per cent. power factor (figs. 2 and 3).

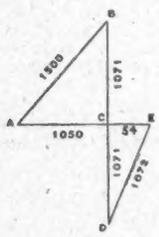


Fig. 1.

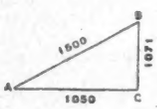


Fig. 2.

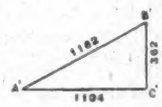


Fig. 3.

Fig. 2.—A B = 1,500 K.V.A. load.
A C = 1,050 KW., true power.
B C = 1,071, wattless component at 70 per cent. power factor.

Fig. 3.—$A^1 C^1$ = 1,104 = true power, including motor input.
$A^1 B^1$ = 1,162 = K.V.A. load at 95 per cent. power factor.
$B^1 C^1$ = 362 = wattless component at 95 per cent. power factor.

Leading component to be introduced into the circuit is—

$$\sqrt{(A\,B + A\,C)\;(A\,B - A\,C)} - \sqrt{(A^1 B^1 + A^1 C^1)\;(A^1 B^1 - A^1 C^1)} = 1{,}071 - 362 = 709.$$

Rating of synchronous motor

$$= \sqrt{(709)^2 + (54)^2} = 711 \text{ K.V.A.}$$

The power factor of the synchronous motor is—

$$\frac{54 \times 100}{711} = 7{\cdot}6 \text{ per cent.}$$

Therefore, by reducing the power factor to 95 per cent. we reduce the capacity of the motor 363 K.V.A., or 34 per cent., and this appears the correct thing to do.

* Sometimes called a rotary condenser when employed for improving the power factor.

Let us now take a case where the motor is made to do mechanical work in addition to raising the power factor of the circuit. Suppose it is required to raise the power factor of a 400-K.V.A. set working at 70 per cent. power factor to 95 per cent. power factor, and also to do all the power possible without overloading the generating set. Here (fig. 4)

A D = 400-K.V.A. load.
A E = 380 KW., true power at 95 per cent. power factor.
D E = 125 = wattless component at 95 per cent. power factor.
B C = 285 = wattless component at 70 per cent. power factor.
C F = B C − D E = 160 (leading component to be introduced).
E C = true input to motor = 380 − 280 = 100 KW.

K.V.A. rating is—

$$\sqrt{(C\,E)^2 + (C\,F)^2} = \sqrt{(160)^2 + (100)^2} = 189.$$

Assuming the loss in the motor to be 10 per cent. of its K.V.A. rating (19 KW. approx.), we have 380 − (280 + 19) = 81 KW. (108 H.P.) in the way of mechanical power; and the power factor of the motor will be $\frac{C\,E}{C\,F}\,100 = 52{\cdot}4$ per cent.

In each of the above cases I have assumed that the steam plant capacity is capable of dealing with the full K.V.A. rating at 100 per cent. power factor.

ENGINEERING EXHIBITS AT THE FRANCO-BRITISH EXHIBITION.

(Continued from page 246.)

A. Reyrolle & Co.—The most interesting section of the firm's exhibits is undoubtedly the ironclad switch panels for central and sub-station work, which can be found in proximity to the Supply Co.'s stands. This switchgear formed the subject of a special article in our issue of July 24th last, to which we must refer our readers. In addition to the above, the firm are showing a variety of drum and lever type starters, high and low-tension fuses and fuse-boxes, oil switches, &c. All Messrs. Reyrolle's starters are fitted with the firm's patent resistance, which has a current-growing characteristic, and much simplifies the operation of starting, as it is only necessary to bring the lever or drum, as the case may be, to the starting position, leaving the resistance to regulate the starting current. The starters in common with all the firm's manufactures, have been designed with a view to standing the rough usage met with in factories, workshops, &c., and are mechanically strong.

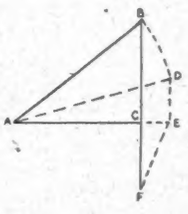


Fig. 4.

John Spencer & Sons, Ltd.—This Tyneside firm are well known for the excellence of their forged and cast-steel products for heavy marine and general engineering work. The stand is conspicuous by reason of a huge boiler plate—some 39 ft. × 12 ft. 10 in. × 1 in. thick—said to be the largest plate that has ever been rolled.

Robt. W. Paul.—Among the exhibits of the National Physical Laboratory are a number of instruments designed in connection with Mr. A. Campbell's work on inductance and capacity measurements. These include a D'Arsonval vibration galvanometer in which frequency can be readily brought into synchronism with the alternating source by means of an external turning head. The mirror is of good size, enabling a bright spot to be obtained when using a Nernst galvanometer lantern, and the sensibility of the instrument is high, being of the order of 1 mm. per micro-ampere at 1 metre, with 100 ~. The resistance of the instrument is about 40 ohms.

Other exhibits in this connection include a fixed and a variable standard of mutual induction, constructed on the lines laid down by Mr. Campbell, as well as a constant-inductance three-dial resistance box and a constant-inductance rheostat. Both these latter are so arranged that as resistance wire is cut out, copper wire having an equivalent inductance is cut in by the same switch arm, thus varying the resistance without varying the inductance, a point of considerable importance in connection with these measurements.

Another exhibit designed on lines laid down by Mr. Campbell consists of two bifilar standard galvanometers. These instruments have practically no "creep" even under prolonged deflection lasting for days, and are very suitable for use as laboratory sub-standards, being used for this purpose at Bushy House.

All these instruments have been constructed by Mr. Robt. W. Paul, another of whose manufactures on view is a single pivot galvanometer, used in connection with thermo-couple temperature measurements at the laboratory.

Reason Manufacturing Co.—In addition to their new type electrolytic meters the Reason Co. show a selection of prepayment meters, maximum demand indicators of thermal and electro-

magnetic type, time switches, &c. They also have a series of their arc lamps, five of which, burning in series off a 500-volt circuit, are to be found over the motor section of the Supply Co.'s exhibit, and two miniature enclosed arcs, run off a 220-volt alternating circuit, are mounted on the two pillars which flank the entrance of the reception room. The centre of the company's main exhibit is occupied by a glass case containing test room and other apparatus designed by Mr. Clark Fisher, amongst which is a specimen of the compensating type potentiometer, with which his name is connected, and which is now solely manufactured by the company under his supervision.

India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.—The company have an Oceanographic exhibit in the Science Section, which contains many objects of interest to the submarine cable engineer. Various submarine growths, specimens of cable picked up from the bottom of the sea, sounding apparatus used in cable laying, photos, charts, &c., are included in the exhibit. The company are also exhibiting samples of their india-rubber tiling, adapted for use on board ship, in public buildings, churches, &c., and for numerous other purposes.

Sunbeam Lamp Co., Ltd.—This company's exhibit includes specimens of the Sunbeam Metal Lamps, which will shortly be placed on the market, for both high and low-voltage circuits. The 220-volt lamps have an efficiency of 1·35 watts per candle, and give some 55 C.P. each; the low-voltage lamps run at an efficiency of 1·2 watts per C.P., the latter measuring about 30. The filaments are strong and should stand fair usage in transit, as borne out by experience.

We understand that the company are at the present erecting a special factory for the production of these lamps, and are also prepared to guarantee the lamps against infringement, as they are working under license of the Westinghouse patents. The company also exhibit a number of electrical accessories.

Messrs. Royles, Ltd., show a variety of heat saving appliances applicable to steam plants, and including feed-water and air heaters, condensers, evaporators, steam traps, reducing valves, &c.

Messrs. Hans Renold, Ltd., are specialists in the manufacture of driving chains, which form their sole product, and they show a great variety of chains, chain wheels, cutters, &c. The exhibit includes patent silent chains; bush roller chains; block, stud, balance, textile, pipe wrench and other special chains, as well as cycle chains. In several cases the parts of the chains are displayed separately, so as to show the construction. The complete chain drives shown include sizes for powers ranging from 3 to 40 H.P., and for speeds from 400 to 1,300 ft. per minute. In the silent chain drive is included a spring wheel, part of the cover of which is cut away to expose one of the springs. This special form of wheel is used for drives where the load is impulsive—as in pumps, compressors, forging machines, &c.

The success of this firm, which was started by Mr. Hans Renold in 1879 in a very small way, is indicated by the fact that the floor space of the two works now measures over 7 acres, and the number of employés reaches 700.

(To be continued.)

"HOFFMANN" BALL BEARINGS APPLIED TO ELECTRICAL MACHINERY.

The Hoffmann Manufacturing Co., Ltd., Chelmsford, Essex, have sent us particulars of their ball bearings for use with electric motors, &c., as shown in the accompanying illustrations.

The lubricating arrangements for a ball bearing consist of a small Stauffer lubricator, as compared with an oil well with rings and throwers on the shaft in the ordinary bearing. The length of the bearing is only half to three-quarters the shaft diameter, enabling the length of the shaft to be reduced and the frame of the motor to be shortened.

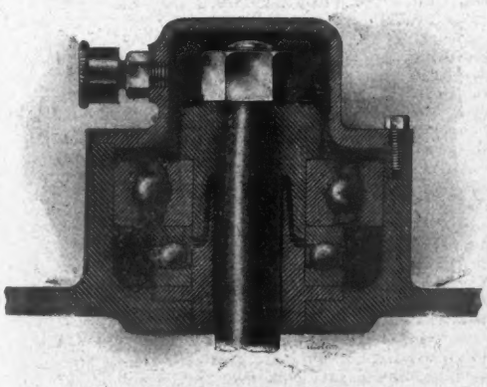


Fig. 1.—Ball Bearing Applied to Vertical Motor.

Among other advantages are reliability; absence of wear and impossibility of the armature dropping on to the pole-pieces; doing away with the oil and the trouble due to its getting on the commutator, into the windings, &c.; and the saving of friction as well as in repairs and oil.

The difficulty of keeping oil off the commutator and windings of vertical motors has made the use of ball bearings imperative in this connection. The method of applying them recommended by the makers is shown in figs. 1 and 2. These show the frame of the motor brought up inside the bearings so as to make it oil retaining.

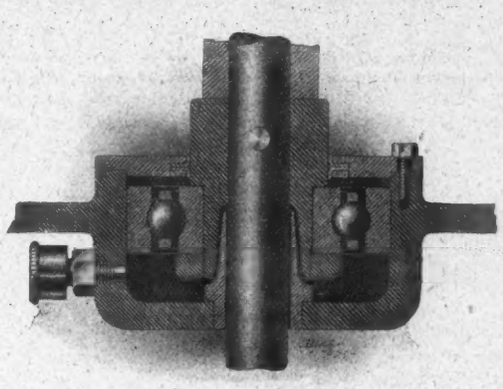


Fig. 2.—Lower Bearing on Vertical Motor.

The weight of the armature is carried on the thrust washer at the top. This may, of course, be fitted at the bottom if found more convenient.

Journal bearings must be so mounted that no side thrust can come upon them; and the thrust bearings so that the two races are perfectly concentric. The best practice is to hold all shafts endways by means of a double thrust washer (fig. 3), and to allow the

Fig. 3.—Hoffmann Standard Ball Thrust Washer.

outer races of the journal bearings to slide in their housings, so that they can locate themselves exactly opposite the inner ball races, which are fixed to the shaft. Fig. 4 shows a complete journal bearing in elevation.

For small horizontal electric motors under 10 B.H.P., which drive by belt, it is not essential to provide thrust bearings, as there is practically no end thrust. In this case it is necessary to fix one

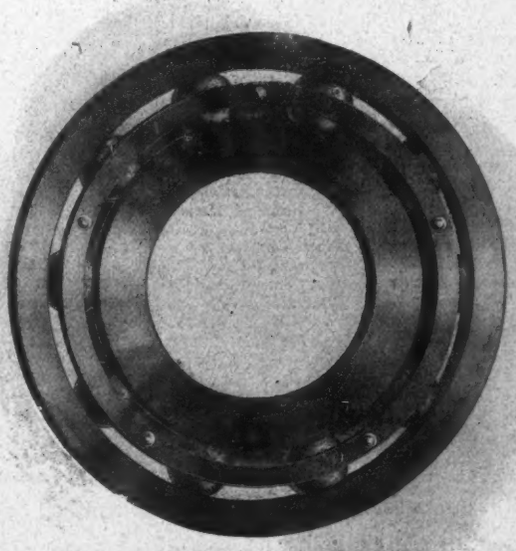


Fig. 4.—Ball Journal Bearing.

outer ball race so as to locate the shaft endways, and to allow the other outer ball race to slide in its housing.

The inner ball race should be a tight press fit on the shaft, as there is a great tendency for this race to creep round the latter, and when this starts it quickly wears into the shaft.

Protection from dust and moisture is important, and for this purpose the makers recommend the form of leather washers, shown in fig. 5. If properly fitted, these "give" slightly and "hug" the shaft.

Ball bearings require very little, if any, lubrication; and this is best accomplished by means of a Stauffer grease lubricator, with which a little grease should be occasionally forced in.

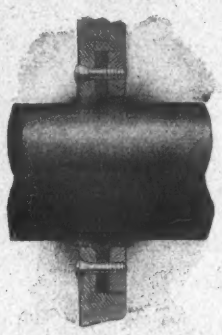


Fig. 5.—Leather Dust Washer.

Electric fans are often fixed to a ceiling or put in some position that makes it extremely difficult to lubricate their bearings, and for these ball bearings are especially suitable.

Portable motors directly coupled to pumps, drills, &c., have to work in any position, and here the use of ball bearings is imperative, owing to the difficulty of retaining oil.

The Hoffmann Co. inform us that they have successfully applied their bearings for carrying loads of from 1 to 500,000 lb., and at speeds from one revolution to 30,000 R.P.M.

MANCHESTER ELECTRICAL EXHIBITION, OCTOBER 3rd to 31st.

This following is the list of exhibitors who had booked space at the above exhibition by the end of July:—

Areo Automatic Fire Alarm Co., 66, Cheapside, E.C.
Allen, Clement, 36, Wilmslow Road, Rusholme, Manchester.
Adams Manufacturing Co., Ltd., 106, New Bond Street, W.
Areators, Ltd., Prana Sparklet Works, Upper Edmonton, N.
Aron Electricity Co., Ltd., 80A, Salusbury Road, Kilburn, N.W.
Arcalia Electrical Manufacturing Co., 504, Stockport Road, Longsight.
Ashton, H., 8-10, Bull's Head Yard, Manchester.
Bullers, Ltd., 6, Laurence Pountney Hill, Cannon Street, E.C.
Blackwell, R. W., & Co., Ltd., 14, Great Smith Street, S.W.
Batty, W., & Sons, Ltd., 7-9, Market Street, Manchester.
Babcock & Wilcox, Ltd., 14, Deansgate, Manchester.
Browett, Lindley & Co., Ltd., Patricroft, Manchester.
Bailey, W. H., & Co., Ltd., Albion Works, Salford, Manchester.
Berry, Skinner & Co., 78, Upper Thames Street, E.C.
Beanland, Perkins & Co., School Close Works, Leeds.
Bray, Markham & Reiss, Ltd., Canada Chambers, Spring Gardens, Manchester.
British Westinghouse Co., Trafford Park, Manchester.
Brown, F. V., & Co., 3, Cross Street, Manchester.
Brown, Boveri & Co., Ltd., Caxton House, Westminster, S.W.
Bruce Peebles & Co., Ltd., Basildon House, Moorgate Street, E.C.
Bullough's Adjustable Rail Joint Support Co., Ltd., Central Buildings, North John Street, Liverpool.
Brady, G., & Co. 49, Pott Street, Ancoats, Manchester.
Bates, W. J., & Co., Victoria Iron Works, Denton, Manchester.
Boddy, G. M., & Co., Newington Works, Liverpool.
British Insulated and Helsby Cables, Ltd., Prescot, Lancs.
Broadbent, T. W., Ltd., East Parade, Huddersfield.
Carbone, Le, 17, Water Lane, Great Tower Street, E.C.
Chamberlain & Hookham, Ltd., Solar Works, Birmingham.
Churchill, Chas., & Co., Ltd., 6, Oxford Street, Manchester.
Clipper Belt Hook Co., 251, Deansgate, Manchester.
Collier, J., & Co., Warwick House, 29, King Street West, Manchester.
Concordia Electric Wire Co., Ltd., 64, Salusbury Road, Kilburn, N.W.
Consolidated Pneumatic Tool Co., Ltd., Palace Chambers, Bridge Street, S.W.
Crypto Electrical Co., 155-157, Bermondsey Street, S.E.
Cunliffe & Croom, Ltd., Broughton Iron Works, Manchester.
Cutler, Wardle & Co., Ltd., 35-37, Dickinson Street, St. Peter's Square, Manchester.
Crossley Bros., Ltd., Openshaw, Manchester.
Chorlton & Knowles, Mayfield Press, Boardman Street, Manchester.
Calmon Asbeston and Rubber Works, Ltd. (and Check Fire Door Co.), 1-3, Trinity Place, Tower Hill, E.C.
Climax Fire Extinguisher Co., 11, Exchange Buildings, St. Mary's Gate, Manchester.
Congdon & Muir, 42, Deansgate, Manchester.
Drake & Gorham, Ltd., 66, Victoria Street, S.W.
D. P. Battery Co., Ltd., Lumford Mills, Bakewell, Derby.
Dugdill, John, & Co., Failsworth, near Manchester.
Daniel, T. H. & J., Ltd., 22, Henrietta Street, E.C.
Dey Time Registers, 100B, Queen Victoria Street, E.C.
Diesel Engine Co., Ltd., 179, Queen Victoria Street, E.C.
Dryden & Co., Grimshaw Street Foundry, Preston.
Dunlop, D. N., Westinghouse Co.'s Publishing Department, Westinghouse Works, Trafford Park, Manchester.
Electrical Engineer, 139/140, Salisbury Court, Fleet Street, E.C.
Ebenestos Manufacturing Co., 127, Pomeroy Street, Old Kent Road, S.E.
Eckstein, Heap & Co., Waverley Mills, St. Simon's Street, Salford.
Edison & Swan United Electric Light Co., Ltd., 36/37, Queen Street, E.C.
Electric and Ordnance Accessories Co., Ltd., Cheston Road, Aston, Birmingham.
Electrical Engineering (Kilowatt Publishing Co.), 203/6, Temple Chambers, E.C.
Electric Journal, 17, Bouverie Street, E.C.
Electrical Field, 30/31, St. Swithin's Lane, E.C.
Electrical Magazine, Bazaar Buildings, Drury Lane, W.C.
Electrical Power and Storage Co., Ltd., 4, Great Winchester Street, E.C.
Electrical Press, Ltd., 37/8, Strand, W.C.
Electrical Review, 4, Ludgate Hill, E.C.
Electromotors, Ltd., Openshaw, Manchester.
Elliott Bros., Century Works, Lewisham, S.E.
Engineer, Ltd., 33, Norfolk Street, Strand, W.C.
Electrician Printing and Publishing Co., Ltd., 1/3, Salisbury Court, Fleet Street, E.C.
Enrst, F., & Co., 31, New Bailey Street, Manchester.
Evans, E. M., & Son, 18A/18B, Fountain Street, Manchester.
Evershed & Vignoles, Ltd., Acton Lane Works, Chiswick, W.
Emmott & Co., Ltd., 65, King Street, Manchester.
Electrical Times, 8, Bream's Buildings, Chancery Lane, E.C.
Faulkner, John, 13, Strangeways, Manchester.
Ferranti, Ltd., Hollinwood, Lancs.
Falk, Stadelmann & Co., Ltd., 83/87, Farringdon Road, E.C.
General Electric Co., Ltd, 67/71, Queen Victoria Street, E.C.
Glyco Metal Co., Ltd., 8/9, South Parade, Manchester.
Green, E., & Son, Ltd., 2, Exchange Street, Manchester.
Grevener, J. & H., Eldon Street House, E.C.
Goodalls, Weaste, Manchester.
Gilbert Arc Lamp Co., Ltd., Chingford, Essex.
Galloways, Ltd., Knott Mill Iron Works, Manchester.
Hall, J. P., & Co., Blackriding Ironworks, Werneth, Oldham.
Harland, G., Bowden & Co., 196, Deansgate, Manchester.
Hart Accumulator Co., Ltd., Marshgate Lane, Stratford, E.
Herbert, Alfred, Ltd., Machine Tool Makers, Coventry.
Hodgkinson, Jas. (Salford), Ltd., Fore Lane Works, Broad Street, Pendleton, Manchester.
Hoffman Manufacturing Co., Ltd., Chelmsford.
Hopkinson, J., & Co., Ltd., Britannia Works, Huddersfield.
Howard Asphalt Troughing Co., Ltd., Trafford Park, Manchester.
Howden, J., & Co., 105, Scotland Street, Glasgow.
Howell, W. R., & Co., 42, Theobald's Road, W.C.
Hans Renold, Ltd., Progress Works, Brook Street, Manchester.
Heatley Gresham Engineering Co., Ltd, 110, Cannon Street, E.C.
Hacking & Co., Lord Street, Bury.
Hebblewaite Bros., Ltd., Huddersfield.
Halcrow, J. (Neuremberg Engine Co.), 18, Coleman Street, E.C.
Heyde, J. Bennet von der, 6, Brown Street, Manchester.
International Electric Co., 55, Redcross Street, E.C.
International Time Recording Co., 151-55, City Road, E.C.
Kendal, J. Lomax, & Co., 4, John Dalton Street, Manchester.
Kennedy Bending Machine Co., 34, Norfolk Street, Strand, W.C.
Key Engineering Co., 38, Deansgate, Manchester.
Kirkpatrick & Rastall, 16, Barrack Street, Hulme, Manchester.
Kenyon, Alex., & Co., Victoria Bridge, Manchester.
Kerr, J., & Co., 62, King Street, Manchester.
Kent, Geo., Ltd., 199, High Holborn, W.C. (in charge of J. Pythia, Throstles Nest House, Congleton).
Liverpool Electric Cable Co., Ltd., 292A, Vauxhall Road, Liverpool.
Lancashire Electric Power Co., 196, Deansgate, Manchester.
Lancashire Dynamo and Motor Co., Ltd., Trafford Park, Manchester.
Lea, J. E., 28, Deansgate, Manchester.
Lyle Trading and Manufacturing Co., Ltd., Temple Bar House, Fleet Street, E.C.
Luke & Spencer, Ltd., Broadheath, Manchester.
Ludw. Loewe & Co., Ltd, 30, Farringdon Road, E.C.
Manchester Corporation, Electrical Department, Town Hall.
Marshall, Percival, & Co., 26-9, Poppin's Court, Fleet Street, E.C.
Massey, B. & S., Steam Hammer Works, Openshaw, Manchester.
Matthews & Yates, Ltd., Cyclone Works, Swinton, Manchester.
Mayer & Schmidt, Offenbach, O/Main, Germany.
Mitcham Electric Fan Co., Ltd., 6, Broad Street Place, E.C.
Mirrlees Watson & Co., Ltd., Scotland Street, Glasgow.
Morgan Crucible Co., Ltd., Battersea Works, S.W.
Musgrave, J., & Sons, Ltd., Globe Iron Works, Bolton.
McDermott, R. W., Old Street, Ashton-under-Lyne.
Morton & Co., 8-9, The Arcade, Lord Street, Liverpool.
Mirrlees, Bickerton & Day, Ltd., Hazel Grove, near Stockport.
Nalder Bros. & Thompson, Ltd., 34, Queen Street, E.C.
National Gas Engine Co., Ltd., Wellington Works, Ashton-under-Lyne.

National Telephone Co., Ltd., 192, Portland Street, Manchester.
New Gutta-Percha Co., Ltd., Dashwood House, New Broad Street, E.C.
Neuremberg Engine Co. (J. Halcrow, 18, Coleman Street, E.C.).
O'Brien & Co., 5, Brazennose Street, Manchester.
Oliver Arc Lamp, Ltd., Cambridge Place, Burrage Road, Woolwich S.E.
Oliver Machinery Co., Ltd., 201-3, Deansgate, Manchester.
Premier Electric Lamp Co., Huyton Quarry, near Liverpool.
Price, Chas., & Son, Broadheath, Manchester.
Parmiter, Hope & Sugden, Hulme Electrical Works, Manchester.
Parsons, C. A., & Co., 65-7, Prudential Buildings, Park Row, Leeds.
Pearn, F., & Co., Ltd., West Gorton, Manchester.
Phillips Commutator Grinder Co., Ltd., 95, Cannon Street, E.C.
Pinchin, Johnson & Co., Ltd., 26, Bevis Marks, E.C.
Pollock & McNab, Ltd., Machine Tool Makers, Bredbury, near Manchester.
Power Plant Co., Ltd., Temple Bar House, Fleet Street, E.C.
Price's Patent Candle Co., Ltd., Belmont Works, Battersea, S.W.
Premier Accumulator Co., Cattlemarket Road, Northampton.
Pearson & Co., 51, Moseley Street, Manchester.
Proctor, Jas., Ltd., Hammerton Street Iron Works, Burnley.
Post Office, Manchester.
Rapid Magnetting Machine Co., 18, The Crescent, Birmingham.
Rhodes, J., & Sons, Ltd., Grove Iron Works, Wakefield.
Richards, G., & Co., Ltd., Broadheath, near Manchester.
Ripolin, Ltd., 35, Minories, E.C.
Robinson, Thos., & Son, Ltd., Railway Works, Rochdale.
Robertson Electric Lamps, Ltd., Brook Green Works, Hammersmith, W.
Ross, A., Hotchkiss & Co., Ltd., 1, Glengall House, Old Kent Road, S.E.
Reyrolle, A. & Co., Ltd., Hebburn-on-Tyne.
Ronald Manufacturing Co., Milner Works, Barnsbury Street, N.
Sub-station.—
General Electric Co., Ltd., Manchester.
Ferranti, Ltd., Hollinwood, Lancs.
Bruce Peebles & Co., Ltd., Basildon House, Moorgate Street, E.C.
British Westinghouse Co., Ltd., Trafford Park, Manchester.
Schaffer & Budenberg, Ltd., 11, Whitworth Street, Manchester.
Shaw, J., & Son, Ltd., Albert Works, Huddersfield.
Siemens Bros. Dynamo Works, Ltd., 196, Deansgate, Manchester.
Sisson, W., & Co., Ltd., Engineers, Gloucester.
Small Power Dynamo and Motor Co., Old Lane, Openshaw, Manchester.
Smith, Frederick, & Co., Wire Manufacturers, Ltd., Anaconda Works, Salford, Manchester.
Standard Machine Works, Ltd., Dame Agnes Street, Nottingham.
Steinthall & Boydell, Ltd., 18, Cooper Street, Manchester.
Stubbs, J., & Co., Mills Street Works, Ancoats, Manchester.
Sunbeam Lamp Co., Ltd., Park Road, Gateshead-on-Tyne.
Supplies, Ltd., Parr Street, Liverpool.
Sanders, Rehders & Co., 108, Fenchurch Street, E.C.
Synchronome Co. (F. Hope-Jones), 32-34, Clerkenwell Road, E.C.
Traun, Dr. Heinr., & Sons, 8, Redcross Street, E.C.
Taylor, Garnett and Evans & Co., Ltd., Blackfriars Street, Manchester.
Taylor, Tunnicliffe & Co., Ltd., Eastwood, Hanley, Staffordshire.
Thomas, Bertram, Worsley Street, Hulme, Manchester.
Union Electric Co., Ltd., Park Street, Southwark, S.E.
Union Standard Machine Co., 165, Queen Victoria Street, E.C.
United States Metallic Packing Co., Bradford (Soho Works).
Whipp & Bourne, Switchgear Works, Castleton, near Manchester.
Wilson, L. E., & Co., 20, Cross Street, Manchester.
Walsall Hardware Manufacturing Co., Hatherton Street, Walsall.
Wallwork, H., & Co., Ltd., Roper Street, Manchester.
Worthington Pump Co., Ltd., 153, Queen Victoria Street, E.C.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Electric Hand Lamps.

With reference to the report of Mr. Ram, from which we quoted last week, wherein the inspector deals with accidents that happened during 1907, owing to shocks received through the medium of the hand lamp itself, THE GENERAL ELECTRIC CO., LTD., of Queen Victoria Street, E.C., write saying that such shocks may be received, first, through the breakdown of the insulation of the flexible leads through constant use, and consequent leakage of current to the metal part of the hand lamp, or, secondly, through the metal guard, which constitutes a part of most hand lamps, coming into contact with live connections. The General Electric Co. have given a great deal of consideration to the subject, and they have been experimenting for some time past, as the outcome of which they are now supplying a hand lamp which is composed almost entirely of insulating material, the only metal parts being the terminals, the screws, and the liner of the holder. It is so constituted that none of these metal parts can possibly be brought into contact with live connections, or with the hand of the person using the lamp. The guard of the lamp is made of a hard, strong, insulating material, and so constructed that it may be thrown about or even stood upon, without sustaining damage (both of these interesting operations were performed this week in the office of the ELECTRICAL REVIEW, without disaster to either the lamp-guard or ourselves).

The makers claim that a universal use of a hand lamp of this description would be the means of preventing many an accident like those which are mentioned by Mr. Ram as having, in several instances, proved fatal, and further, that it would practically remove

FIG. 1.—G.E.C. ELECTRIC HAND LAMP.

the possibility of fires which are, in some cases, also traced to the use of a faulty hand lamp. The company will send full particulars and a sample of this hand lamp to any reader of the ELECTRICAL REVIEW who may be interested in such a device.

"Universal" Junction Box.

THE METALLIC SEAMLESS TUBE CO., LTD., of Wiggin Street, Birmingham, are making a new cast-iron box for conduit work. It is known as the Universal "A" box, and can be used for almost any purpose. In a list just issued by the firm its adaptability

FIG. 2.—WITH TUMBLER SWITCH.

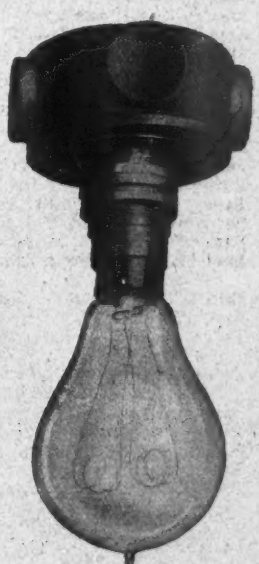


FIG. 3.—LAMP-HOLDER FITTING.

as a junction box, a pendant fitting, a ceiling rose, and as a switch-box and lamp-holder fitting is illustrated. The boxes are specially made for screwed conduits, and are supplied in all sizes up to 1½ in. The firm also make other junction boxes in the "Universal" type—namely: "C," which is an oblong junction-box made in two, three or four ways; and "D," which is used as a connection or inspection "T" box, and is made in three ways. Fig. 2 shows the box with tumbler switch, and fig. 3 represents it with a lamp-holder fitting attached.

Indestructible Cables.

The "Indestructible" Cable Co., 47-51, Park Street, London, S.E., have sent us particulars of their system of covering wires, which consists in applying to the latter a coating of red-lead and linseed oil—a preparation invented by Mr. Hackethal, Telegraph-Director of the Imperial German Post Office. This material insulates and preserves the conductors; it is particularly suitable for overhead lines exposed to deleterious atmospheric influences, acid fumes, &c. The "Indestructible" cables have been largely used, for example, in the Simplon Tunnel.

Arc Lamp Suspension.

The street lighting of Eastbourne has for many years been largely effected with arc lamps, carried on swan-neck side-poles, centre-poles, and span-wires, and these have all been fitted with lowering gear except four centre-poles of the lyre type, which until recently had to be trimmed with ladders. These four lamps, however, have now been brought into line with the rest by the London Electric Firm, of George Street, Croydon, who have adapted their patent contact and suspension device to the carriers. The lamp-post is shown in the accompanying view (fig. 4); a cross arm is fitted right through the hood, and a wire rope, working over

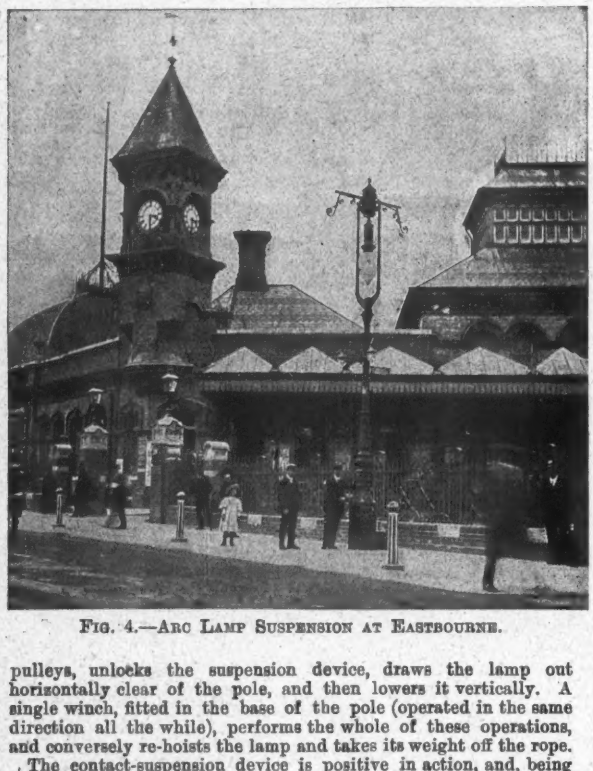


Fig. 4.—Arc Lamp Suspension at Eastbourne.

pulleys, unlocks the suspension device, draws the lamp out horizontally clear of the pole, and then lowers it vertically. A single winch, fitted in the base of the pole (operated in the same direction all the while), performs the whole of these operations, and conversely re-hoists the lamp and takes its weight off the rope. The contact-suspension device is positive in action, and, being on the concentric principle, does not require to be manœuvred to ensure correct polarity. The winch is self-sustaining in all positions without ratchets, pawls or gear wheels, and will not run back, thus avoiding accidents.

New-Style Trestles.

For attention to lamps, as well as for dusting and cleaning purposes, it is convenient to have a platform upon which the workman can stand and be free to use both his hands; and the illustration (fig. 5) shows a new style invented by Mr. Heathman, of Parson's Green, Fulham, which has the advantage of adjusting at various heights as well as of closing into small space for storage. It is also fitted with wheels so as to be easily moved about, and is undoubtedly a most useful invention.

Fig. 5.—New-Style Trestles.

CORRESPONDENCE.

Letters received by us after 5 p.m. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

A Contract Short-Circuited.

As a side light on bad trade, and what some people must imagine to be the panic-stricken state of the electrical trade in particular, I give you the following instance:—

Two well-known firms of contractors applied to us for catalogues of a particular telephone speciality that we manufacture. The business seemed to be going along satisfactorily, when we have a call on the telephone from a firm of furriers, stating that they have our catalogue, asking for our best terms, and saying that they have a man about the place who can fit the instruments. Fortunately, our contracting friends had informed us in what street their job was going, and on our declining to quote the furriers any terms, we were courteously informed that the order would go elsewhere. Poor contractors! If this is a fair sample of the treatment their efforts receive!

London Manager.

International Electrotechnical Commission.

Referring to page 237 of your issue of August 7th, it is not clear whether the definitions as given are final, or whether they are still open to modification. In any event, I consider there is much to criticise, but only propose to refer to one item.

We are told that the abbreviations "B.T.U." or "B. o. T.U." are not recommended, and—in effect—that we should say "Board of Trade unit," "kilowatt-hour," or "unit." The first two terms are unwieldly and the latter vague; and considering that this is one of our most important units, it is surely time that it received a name. I was under the impression that it was to be christened the "Kelvin," or "Kelv."

W. Perren Maycock.

Sale, *August 11th*, 1908.

I notice that on page 274 definitions by the International Electrotechnical Commission of various electrical terms are given. Among others are the terms "earth" and "ground," the meaning of the latter term being given "refer to earth, practically the same meaning." Now this is rather misleading, as traction men commonly use the term "grounded" in an exactly opposite sense, viz., when a car is *insulated* from the return rail, thus preventing the operation of the car it is said to be "grounded," whereas if the car wheels were actually "earthed," of course the car could be operated. I thought for the benefit of your readers this would be rather an interesting paradox.

Chas. H. Thorpe.

London.

Registration of Wiremen.

I must thank you for the very lucid explanation you have given, in your last issue, of the scheme I am initiating for the above, and beg to state that I now have on my books some 300 names of different classes of workmen who are out of employment.

With regard to limiting the advantages of the bureau to members of the Association, although my committee came to a resolution on this point, still I agree with you that where non-Association firms have helped us to get the desired information, they should benefit if they so desire, and I shall hold myself in readiness to assist any firm who may think fit to avail themselves of my services. I may add that I have already supplied some 20 men to different firms who are not members of my Association.

Thanking you for your support.

Leonard G. Tate,
Hon. Sec., The Electrical Contractors' Association (Incorporated).

London, E.C., *August 14th*, 1908.

Are Consulting Engineers Necessary?

Mr. Hooghwinkel, in your issue of July 10th, suggested that manufacturers and the profession put their heads and hands together. That is a beginning. Will you, Sir, facilitate progress by receiving the names of those who will meet to discuss the subject of the best way to conserve the interests of clients, consultants, and manufacturers?

My opinion differs from Mr. Hooghwinkel's as to the difficulty of getting rid of black sheep. I believe, as intimated before, that those who lack principle in one respect will not fail to take advantage of a new institute, or conference, or protection; but that need not deter any from their best efforts towards a desirable end. I deprecate so general a statement as "the manufacturer is not qualified to do consultant's work." No reasoning man thinks that all are. Some manufacturers are better qualified than some consultants for the latter's work.

Further, any man's business is what he qualifies himself to do, I almost added, honestly and well; but I have not discovered a way to expel dishonesty and falsehood. Nor am I convinced that the fundamental motive for wanting such removed from our midst is purely unselfish.

Manufacturers are unlikely to accept Mr. Hooghwinkel's proposal for them to refuse to quote unless a well-known consultant has prepared the specification. I fail to see the *quid pro* manufacturer in exchange for his forcing a fee into a consultant's hands.

A Manufacturer.

London, *August* 10*th*, 1908.

The Electrical Industry.

With reference to your correspondence on the above subject, I think that the trouble with the electrical industry is a financial one, and what the industry requires is thoroughly purging. The usual terms in the trade are 2½ per cent. discount for cash the month following delivery. Now, say that the electrical and allied trades were to insist on these terms being strictly adhered to, and also to insist on all accounts being settled on a strictly net basis not later than the following month, I think that under these circumstances the industry would soon be purged; but the question would then be, How many firms would be left after some six or twelve months? If this rule were practised in the trade generally, it would very soon stop a good deal of the gambling and over-trading which at present is rampant in the electrical industry, and would also very soon stop firms from taking on orders at cost of labour and material only, or even less. Still, what is the use of discussing any question depending on united action? Who ever heard of combined action in the electrical industry?

Richard C. Dieppe, A.M.I.E.E.

Brixton, *August* 14*th*, 1908.

I am sorry if my letter, which appeared in your last issue, was the result of a misunderstanding of your question, but as I did not see, and do not now see, the disagreement you allege between the review of the *Manual* and the articles to which you referred, I could not interpret your question otherwise than as "What is wrong with the Electrical Industry?"

There is no inconsistency between the statistics of progress and the truism that the industry is in a depressed state. It is one of my chief contentions that the scope for electrical enterprise in this country is considerable, but that the conditions under which the increasing work is done are unfavourable, and the results not as profitable as they deserve to be—except to the foreigners.

This seems to be admitted by you, but you suggest that I am ignoring the various remedies you have indicated. Far be it from me to do anything of the kind. On the contrary, my proposal is that an organisation should be formed to discuss your and other suggested remedies, and with a view to combined action. I venture, however, to express the hope that we shall be able to adopt other remedies besides—to use your words—"a weeding-out process and a consequent gradual extinction of the weaker firms," because such a process acts frequently in the direction of eliminating the strong as well as the weak.

Why is it that some of our best men have given up electrical enterprise and others have become representatives in this country of foreign firms instead of employing British labour? Because they find it easier and more profitable to change their environment than to take part in the unceasing struggle to keep the works going merely to cover expenses. The men who leave the industry or serve the foreign manufacturer may be the wiser, but is it altogether just or even expedient to disparage those who continue the struggle or to treat with contumely their efforts to ameliorate the conditions?

As a regular reader of the ELECTRICAL REVIEW for more than a quarter of a century, I have always admired your fearless and outspoken opposition to that which is spurious, and your unstinted praise of everything that makes for the best development of the industry. I have every confidence, therefore, that we shall not look in vain for your counsel and support when we are able to deal with the situation. Something must be done if British interests in the electrical industry are not to be entirely suppressed by industrial invaders aided, firstly, by our socialistic legislation, and next by the indifference of the Government to the reasonable claims of the industry, but which in the absence of efficient organisation cannot be effectively asserted.

In the present conditions of accentuated rivalry, not to say jealousy,

> Men construe things after their fashion
> Clean from the purpose of the things themselves,

and it is difficult enough for anyone to show initiative in a matter concerning the common good and get his preamble accepted without being required to formulate all the clauses of his Bill.

The modest suggestion that we should confer together and endeavour to combine for united action is, in my judgment, the best proposal that can be made under the circumstances.

E. Garcke.

Donington House, W.C.
August 18*th*, 1908.

BUSINESS QUERY.—A correspondent wishes to be informed of makers of automatic cut-outs for transformers used in metallic-filament lamp circuits.

REVIEWS.

The Mathematical Theory of Electricity and Magnetism. By J. H. JEANS, M.A., F.R.S. Cambridge: The University Press.

The ideal advanced student, before he proceeds with his investigations in the special field of research which he has chosen, should undoubtedly be equipped with a thorough knowledge of the principles of electromagnetic theory. Twenty years ago the only English book available was Maxwell's treatise, written for the mathematician, and therefore practically unintelligible to all but a very select few. Prof. J. J. Thomson's elementary treatise came next, and it has been followed by several others. Between these books, however, and Maxwell there is a *hiatus valde deflendus*, which Prof. Jeans has now bridged with this handsome volume. As practically all the very few physical mathematicians who are competent to write a book of this nature, have their spare time fully engrossed by research work of absorbing interest, it is no wonder that we have had to wait so long for an author who would clear up those difficulties which prove such stumbling blocks to the average physicist. Prof. Jeans therefore deserves the highest praise for having accomplished a task which he confesses had little interest for him, but which he undertook in the hope that it would prove helpful to those engaged in the teaching or study of mathematical physics. In our opinion the work will prove helpful to many. Those who are thoroughly familiar with Maxwell's book will appreciate both the author's simplifications of the theory and the increased mathematical rigour of some of his proofs.

The first three hundred pages are devoted to the general theory of electrostatics. The next hundred to current flow and *magnetostatics* and the last hundred to electromagnetism. The author explains in his preface why he has devoted so much space to electrostatics. The reason is that he has included in this space a discussion of non-electrical subjects like the potential theory and the theory of stress, which although essential to the electrical student are equally essential to students of other branches of physics. Many theorems in pure mathematics are also given under electrostatics, for instance—Green's theorem, harmonic analysis, complex variable, Fourier's series, conjugate functions, curvilinear co-ordinates, &c. In our opinion, however, there are two notable omissions in this part of the subject, namely, Elliptic functions and Bessel functions. No one can understand recent advances in electromagnetism without a knowledge of the definitions and the more important properties of these functions.

In those portions of the subject the treatment of which demands the highest mathematical skill or a complete mastery of dynamical laws, Prof. Jeans inspires the reader with the greatest confidence. When, however, he touches on those subjects which border on practical engineering, he gives the reader the impression that he is hurrying him on through a region beset with pitfalls for both. On page 447, for example, we read that "the quantity $p/2\pi$ may be supposed to represent the number of alternations per second —*i.e.*, the number of revolutions of the engine by which the dynamo is driven." The engineer naturally wants to multiply the number of revolutions per second by the number of pairs of poles of the field magnet circuit, so as to make this statement accurate. On page 469, after the theory of the skin effect with alternating currents is explained, we read :—"The results we have obtained will suffice to explain why it is that the conductors used to convey rapidly alternating currents are made hollow. . . ." We believe that the Deptford concentric cables, long since removed, were the only ones in which the inner conductors were made hollow, with the avowed object of diminishing the skin effect. Practically the skin effect is only prominent in very exceptional cases. On page 61 it is stated that "the object of the lightning conductor is to ensure that the intensity shall be greater at its point than on any part of the buildings it is designed to protect." We think this is erroneous; the common fashion nowadays is to use moderately blunt ends to the conductors, as at St. Paul's or Westminster Abbey. Lodge's theory is now universally accepted by architects and electricians.

On page 455, after proving in an extremely neat fashion Maxwell's formulæ for the effective resistance and self-inductance of the air core transformer, he points out its practical application in connection with every-day transformers where the current is usually "of very high frequency." Assuming it infinite, he proves certain results which may be of value in wireless telegraphy, but which are of no use for ordinary lighting transformers. He proves that $\mathrm{M}i_1 + \mathrm{N}i_2 = 0$ when both i_1 and i_2 are infinitely small. What the engineer wants is that $\mathrm{L}i_1 + \mathrm{M}i_2$ is practically the same function of the time at all loads—that is, that the resultant magnetising turns for the core of the constant potential transformer remain the same at all loads.

When the author touches on modern theory he is extremely good. "The charge of an electron is enormously large compared with its mass—the charge of each being about 3×10^{-10} in electrostatic units, so that a gramme of electrons would carry a charge equal to about 3×10^{17} electrostatic units. To form some conception of the intense degree of electrification represented by these data, it may be noticed that 2 grammes of electrons, if placed at a distance of 1 metre apart, would repel one another with a force equal to the weight of about 10^{21} tons. Thus the electric force outweighs the gravitational force in the ratio of about 10^{42} to 1." (Page 20.) This ratio puts a severe stress on the credulity of the average person.

The author, like most mathematicians, gets vague when he discusses capacity. On page 73 we read: "This explains why a condenser is so much more efficient for the storage of electricity than a single conductor." This gives the impression that a conductor stores electricity in a different way to a condenser.

Now, the electrician regards the capacity of a conductor as the capacity between it and the earth, the two forming the electrodes of a condenser; he does not, therefore, need to be told that its capacity is small compared with that of two large plates close together. We think that a definition of what is meant by the capacity between two conductors should have been given.

The method of finding the formulæ for the coefficients of capacity and induction between two spheres is good, but the reason for inverting the historical order is not apparent. Kelvin's method is used for finding series for the coefficients, and these series are then converted into definite integrals given by Poisson. We think the physicist would have little use for these integrals. The series can be converted into more suitable forms without difficulty. For instance,

$$\Sigma\, a^s/(1 - a^{2s}) = \mathrm{F}(a) - \mathrm{F}(a^2),$$

where $\mathrm{F}(a)$ denotes Lambert's series $\Sigma\, a^s/(1 - a^s)$, which, as Clausen has shown, can be calculated very readily be means of a suitable transformation.

A curious misprint occurs in Example 27, page 284—"Two *insulating conducting* spheres . . ." A question like this is rather hard on the student. The author is sometimes a little obscure. On page 295, for example, we read, "by a linear conductor being meant one that has a definite cross-section at every point." On page 321, what electricians call the "time constant" of a shunted condenser is called the "modulus of decay." On page 400, Steinmetz's formula for hysteresis loss is not given, presumably because it is empirical. On page 428, the author follows the usual Cambridge fashion and attributes what is generally called Laplace's formula to Ampère. There are sound grounds for attributing it to Biot and Savart, but we have never been able to find out the reason why some people call it after Ampère. On page 435 it is pointed out that the self-inductance of a wire becomes infinite when the wire is infinitely thin. This is correct. But it is also stated that the energy is infinite. This is wrong, for if this were so, the current density would be infinite, which is absurd.

One drawback to the book is that practically no formulæ for self-inductance and mutual inductance are given. Now Maxwell's treatise contains many such formulæ, but his proofs can be very considerably simplified, and these proofs would be most useful if included in this book.

The treatment of rapidly alternating currents is a little too sketchy. Physicists use Kelvin's formulæ containing bei and ber functions or J. J. Thomson's, containing Bessel functions, and they have to study the subject somewhat carefully. We were much interested when studying the three concluding chapters on the dynamical theory of circuits, displacement currents, and the electro-magnetic theory of light, which are perhaps the most useful in the book.

There are a few misprints. Example 20, page 461, and example 1, page 493, are practically identical. In both of them the frequency is given as p instead of $p/2\pi$. If example 5, page 473, is correct, the magnetic force at the surface of the plate is always in phase with the magnetic force in the middle of the plate. This is too good to be true; the correct formula is given in Russell's "Alternating Currents," Vol. I, page 358. In the last line of the fourth paragraph on page 445, $\mathrm{L}i^2$ should be $\mathrm{L}i^2/2$. On page 446, line 7, simply-harmonic should be simple harmonic. In example 3, page 458, $\mathrm{C}\,\mathrm{L}\,\omega$ should be $\mathrm{C}\,\mathrm{L}\,\omega^2$. On page 459, line 3 from the bottom, I_1, I_2 should read L_1, L_2, and for M in example 4, page 494, read M^2.

The University Press are to be complimented on the sumptuous appearance of this volume, on the clear printing, and on the freedom from printer's errors. It is a book which we can heartily recommend to the mathematical electrician or physicist, and there is much in it which can be appreciated by everyone interested in electrical theory.—A.R.

Magnetism and Electricity. By S. S. Richardson, B.Sc. Messrs. Blackie & Son.

This is a clearly written treatise of 590 pages, divided into three portions, viz., Magnetism, Static Electricity and Current Electricity.

The author very rightly commences with Magnetism, which appears to be the generally adopted system nowadays,

especially when laboratory work follows the lectures. In the magnetic work many simple experiments of a quantitative kind can be devised whereby the student obtains some knowledge of measurements before tackling more difficult portions.

Pages 1 to 112 are then devoted to Magnetism, and deal with the usual subjects, such as methods of magnetisation, Coulomb's torsion balance, deflections and oscillations, the dip, Gauss's A and B positions. The anchor ring and solenoid seem rather out of place on page 84, the student not having been introduced to electro-magnetism. Finally, the magnetic-circuit equation is dealt with.

Static Electricity follows, and Weinhold's electroscope is shown on page 135. Why such an obscure and useless piece of apparatus should have been selected, it is difficult to perceive. C. T. R. Wilson's electroscope would have done admirably. Then follows the usual matter, and Coulomb's torsion balance again, although everyone knows the utter hopelessness of this piece of apparatus for experimental purposes where charges of electricity are concerned.

Next there are chapters on condensers, dielectrics and electrostatic machines. Might not current electricity have been introduced by saying something about discharges through gases here?

Part III, on Current Electricity, occupies the next fifteen chapters, which include Resistance, and "Joule" Heat, Electrolysis, Transient Discharge, Energy, Power, &c., and a very brief chapter on Discharge through Gases.

On the whole, the book is very clearly written, and may be recommended for the purposes stated in the preface—viz., Intermediate Science and Board of Education, Stage II. The writer considers, however, that Magnetism, Current Electricity, and *then* Electrostatics would be a better arrangement. In a table at the end of the book values of B are given as 8,150, 16,750, 17,750, implying an experimental degree of accuracy of $\frac{5}{8}$, $\frac{5}{16}$ and $\frac{5}{18}$ per cent. approximately. However, this is found in most treatises dealing with magnetic induction, so it must be excused.

The writer also considers it time now that Coulomb's torsion balance, Reiss's spark micrometer, Ruhmkorff's commutator, the universal shunt, Barlow's wheel and Roget's spiral were omitted from such treatises.

BUSINESS NOTES.

Underfeed Stokers.—We are informed that the Underfeed Stoker Co., Ltd., have recently received a large number of orders for the equipment of water-tube and internally-fired boilers with stokers, for use in Great Britain. Among these are included:—

Corporation of Maidstone.—Eight B.3 stokers for Lancashire boilers.
Lancashire and Yorkshire Railway, Newton Heath.—Ten B.5 stokers for Lancashire boilers.
Borough of Fulham.—Two "E" stokers for Babcock & Wilcox boilers.
Corporation of Bath.—Two "E" stokers for Babcock & Wilcox boilers.
Corporation of Newport.—Three "E" stokers for Babcock & Wilcox boilers.
Borough of Poplar.—Two "E" stokers for Clarke, Chapman boilers.
Corporation of Lowestoft.—Two "D" stokers for Babcock & Wilcox boilers.
Newmarket Electric Light Co.—Four B.3 stokers for Davey, Paxman boilers.
Borough of Stepney.—Two "E" stokers for Babcock & Wilcox boilers.
St. James's and Pall Mall Electric Lighting Co.—One "E" stoker for Babcock & Wilcox boiler.
County Borough of Devonport.—Four "E" stokers for Babcock & Wilcox boilers.

Test on 5,000-KW. Turbine at Manchester.—During June last tests were carried out on the steam turbine recently completed by Messrs. Willans & Robinson, Ltd., of Rugby, at the Stuart Street station of the Manchester Corporation. It will be remembered that the unit in question is rated normally at 5,000 KW. at full load, whilst it is capable of running continuously at a load of 6,000 KW. The speed of the set is 1,000 R.P.M.; the turbine is supplied with steam superheated 100° F., and exhausts into a vacuum of 27 in., this being the highest vacuum practicable in view of the high temperature of the circulating water prevailing. The result of the trials showed that at 5,000 KW. the steam consumption was ·03 lb. higher than the guarantee. At 5,500 KW. the results were ·07 lb. better than those guaranteed, and at 6,000 KW. the results obtained complied exactly with those guaranteed. At the time when this contract was placed, doubt was expressed in certain quarters as to whether the results promised would be obtained in actual practice, and it is, therefore, satisfactory to note that the results at the normal loads of operation are somewhat better than the actual guarantees.

The American Business Situation.—The *American Electrical Record* quotes Walter H. Whiteside, president of the Allis-Chalmers Co., as follows from the *Wall Street Journal*:—

"There is a marked improvement in general business. Within the last 90 days the bookings of machinery orders have increased from 30 per cent. to 50 per cent. of normal. The business for June to date indicates that at least 65 per cent. of normal will be reached. New inquiries received are constantly increasing in number and volume. They are of a much more substantial character than at any time since the depression began. Their general tone denoted extensive plans in contemplation and for early development; the question of prompt shipment being already regarded an important consideration.

"The immediate requirements for a larger volume of new machinery for necessary extensions and improvements to existing plants are greater than for four years. This for the reason that with many operating companies purchases which under ordinary circumstances would have been made a year or 18 months ago were put off, due to the monetary and other conditions, until to-day the factor of safety in these plants is becoming a serious matter and new equipment must be added.

"Unlike previous depressions, following which collections for comparatively long periods continued very unsatisfactory, there was a substantial improvement within a short time after the recent flurry, and at the present time collections are exceptionally good.

"While some difficulty may still be experienced in the way of financing entirely new undertakings, yet the financial condition of the relatively small buyer is on a sound basis and credits are about normal. In fact, the improvement in new orders placed is from the smaller class of purchasers, who are, commercially, an important factor. Of course, this class of business is widely diffused, but in the aggregate it is greatly stimulating improved trade conditions.

"The business outlook is distinctly encouraging."

Trade Announcements.—The General Electric Co., Ltd, have removed their Newcastle-on-Tyne branch from 6, Clayton Street East, to much larger and more conveniently situated premises at Gallowgate House, 30, Gallowgate, Newcastle-on-Tyne.

The "Contract Journal" Co., Ltd., announce that the offices of *The Contract Journal* and *The Contractor* have been removed to 127-130, Temple Chambers, Temple Avenue, London, E.C., where all communications must be addressed.

The Warner Engineering Co., Ltd., advise us that the manufacture of the "M. G. Warner Truck," under the British patent No. 15,059, granted to Mr. J. Sutherland Warner in 1905, has now been taken over, and standard types will be supplied by Messrs. Mountain & Gibson, Ltd., of Elton Fold Works, Bury, Lancashire. The conversion of existing trucks will be undertaken either by the Warner Engineering Co., Ltd., or by Messrs. Mountain & Gibson, Ltd. The patents in France, Germany and the United States are worked by the foreign companies controlled by the Warner Engineering Co., Ltd., and also the Warner Railway Engineering Co, which is undertaking the application of the system to goods and passenger wagons on British railways.

Messrs. Smith & Clarke, electrical engineers, have opened premises at 10, Vine Street, Grantham.

The Price of Rubber.—In the course of his speech at the annual meeting of the Leyland and Birmingham Rubber Co., Mr. J. E. Baxter, according to a report in the *Times*, said that the rubber trade had experienced very troublesome times, due mainly to the very high prices which ruled for raw materials, and other materials necessary for rubber manufacture. The reason for the high prices of rubber was largely due to the great over-production of motor tires, which accounted for the absorption of tremendous quantities of raw rubber. Personally, he did not anticipate a repetition of extreme prices of crude rubber such as was then experienced, particularly when they considered the rapid strides which had been made in the planting of cultivated rubber. In Ceylon, the Straits Settlements and British North Borneo there were thousands upon thousands of acres being placed under cultivation, and plantation rubber was coming into the market in thousands of tons, the output being doubled annually. The price would necessarily settle itself down to a regular one, which would handsomely pay the planter and enable the manufacturer to produce at a fair profit and largely extend his business.

Openings in Italy.—H.M. Consul at Milan (Mr. J. H. Towsey) has forwarded a copy of a Report issued by the Italian Ministry of Agriculture, Industry and Commerce on electrical installations authorised in Italy during 1907. The Report may be seen by British firms interested, on application at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C.—*Board of Trade Journal.*

Condensing Plant Contracts.—The Mirrlees Watson Co., Ltd., have recently received orders for a number of condensing plants, among which are the following:—

Borough of Southport.—Surface plant.
Aktiebolaget de Lavals Angturbin, Stockholm.—Two surface plants.
Mitsui & Co.—Two surface plants for Kobe Electric Railway, Japan.
James Howden & Co.—One surface plant for the British Mannesman Tube Co.
Blanc & Co., Johannesburg.—One surface plant.

"Fluxite."—We understand that the Fluxite soldering paste supplied by the Auto-Controller and Switch Co. has recently been adopted by both the Indian and the Egyptian Governments, from whom the firm have received large orders for this flux.

E

Consular Notes.—RUSSIA.—The British Consul at Moscow, in a recent report, states as regards the construction of the new electric tramways in that town, that as the municipality had not the necessary funds for completing the conversion of the tramway system to electric traction, foreign contractors were allowed to put in estimates, and a preliminary contract was signed with a British firm of tramway contractors. The municipality, however, obtained the necessary capital by means of a loan which was floated by a British bank, and the construction will be carried out by the municipality itself, the contractors being given orders for cables, electrical machinery, &c., in lieu of the contract. The Swedish-Danish-Russian company, which has a monopoly for telephones in Moscow, some eight years ago had about 500 subscribers. At the present moment there are about 25,000, and the company is enlarging its premises so as to deal with 50,000. The present annual charges are: Private telephone, 71 roubles (£7 10s.); public telephone, 102 roubles (£11); these charges relate to within the 2 verst radius; outside of that radius the prices are raised.

UNITED STATES.—The British Consul at Portland (Oregon) states that wireless telegraph stations under the control of the Navy Department are now in operation at Cape Blanco, North Head, Columbia River, Tatoosh Island, near Cape Flattery, and at Bremerton Naval Depôt. According to latest available reports, there are 286 miles of electric railway in Oregon, two-thirds of which are in Portland. In Washington there are 330 miles. All the States in this district are fortunate in the possession of extremely valuable water-powers, which are being utilised in supplying the cities with electricity for lighting and power for tramways and factories. A report of the Bureau of Statistics of Washington estimates the available horse-power in the more important streams of the State at 2,920,000.

MADEIRA.—H.M. Consul at Madeira reports that regarding a telephone system in the island, he is informed that this is still being argued for and against, but that sooner or later it will be introduced. The question appears to be whether the system shall remain a Government one or not, and the expenses have to be looked into and considered most carefully. The general opinion, however, is that whatever plan is adopted it would well repay the outlay. The electric lighting still continues in the hands of the company. It has been rumoured that a British company was to take over the whole plant and erect a new installation, but as far as the Consul can ascertain, nothing definite has been settled.

FRANCE.—The British Consul at Lyons, in a recent report, states that a Paris company have made proposals to the French Government for the construction of an enormous barrage, 230 ft. in height, across the Rhone below Bellegarde, forming above stream a reach 14 miles long from the dam to the lake, and down stream a greater waterfall, from which it is proposed, by means of hydro-electric works, to obtain over 100,000 H.P. for transmission to Paris. Though this proposal for a dam has met with considerable support, public opinion in the Ain and Rhone Departments, through which the river passes between the Swiss frontier and Lyons, is by no means unanimously in favour of the scheme, it being strongly held in many quarters that the power generated by the river should be reserved for the benefit of the district through which it flows, and not sent to Paris. It is, moreover, possible that the Jonage Co. may have a word to say in regard to the barrage as it might conceivably diminish the volume of water in the Rhone to such an extent as to affect prejudically their own power works. Another scheme which has been mooted in connection with Rhone navigation is one for the construction of electric traction by means of overhead trollies, similar to those used for tramways, by means of which boats could go up the swift and powerful stream at all seasons. The drawback to this system already in vogue on the Teltow Canal is the liability of the trolley to be jerked free of the live wire by the sudden movements of the boat, but two French engineers claim to have found a means of overcoming this difficulty by interposing a sort of "vedette" between the vessel and the trolley, so that no oscillations or violent movements of the boat can reach the trolley but are neutralised by the intervening "vedette." The current for this purpose, which would also serve to light the waterway so as to permit of navigation by night, would be obtained from power stations in the valleys of the various tributaries of the Rhone. The very swiftness and force which place such formidable obstacles in the way of the navigation of the river at all seasons of the year are just such as to attract those who are looking for cheap and abundant water power. This is no new development, for 35 years ago a French company obtained a concession for harnessing the river at Bellegarde and utilising the power thus obtained for driving machinery in a variety of factories. Since that time the Cie des Forces Motrices du Rhone, commonly called the Jonage Co., have deflected the river from its course just above Lyons and they supply power to the town at the rate of 12,000 H.P. every 24 hours for numerous industrial purposes. This immense undertaking which was only carried through in the teeth of strennous opposition from certain hostile quarters, has proved such a triumphant success that it is small wonder that a proposal has recently been made for the construction of similar works on a smaller scale all along the course of the river from Lyons to the sea, in order to supply power to factories in the town and country districts through which it flows. Though the idea of utilising the latent forces of the Rhone is no new thing, the development of the actual use of water power in France is, next, perhaps, to the growth of the motor-car industry, the most remarkable feature in the industrial history of the country during the last half century, and though less than 10 years' old has attained quite extraordinary proportions, not least in Savoy, Dauphiné and Jura. Every year fresh streams are laid under contribution for hydro-electric power. The traveller cannot but be struck by the amazing enterprise and progress of which these works are the outward and visible sign throughout the region round Grenoble. The total water-power obtained in the Alps to-day amounts to nearly 300,000 H.P. Opinions differ materially as to the total latent power still available, but even the lowest computation puts the yearly average obtainable at 2,300,000 H.P., while the Chief Engineer of Transports, Monsieur Tavernier, estimates it as high as 15,000,000 H.P. The works are of two kinds. The first consists of factories engaged in the electro-metallurgical and electro-chemical industries, and utilising water-power obtained by them on the spot, for the manufacture of aluminium, calcium carbide, ferro silicium, &c. These at present utilise over 100,000 H.P. in the Dauphiné alone. The other kind consists of the enormous power stations, pure and simple, for supplying current to various works, not only in the neighbourhood, but within an ever-growing radius. Lyons is lighted by power from the Volta Works at Moutiers, belonging to the Grenoble Power and Light Co., which sends 6,000 H.P. over a distance of 112 miles under a pressure of 57,000 volts, while from Lyons to Valence the whole Rhone Valley is fed by power stations situated in the departments of the Savoy and Isère. Even St. Etienne and Roanne, in the department of the Loire, will, before long, be using electricity generated far away on the other side of the Rhone in the valley of the Drac, a tributary of the Isère. If the present rate of progress be maintained, in a few years the whole of France will be supplied with hydro-electric power from a few distributing centres. It would be difficult to over-estimate the industrial importance of such a development.

BRAZIL.—The British Consul at Rio de Janeiro, reporting on the trade of Brazil, states that there is no doubt that the most effective way for merchants and manufacturers to extend their business in Brazil is through the employment of efficient travellers. The selection of travellers is, however, often very unfortunate. Efficiency in this line depends mainly, and, in the first place, on a thorough and practical knowledge of the goods dealt in, a knowledge that is only acquired by years of service and study in business. It is seldom, however, that men who are high up in the business are selected for the work; more often than not a young connection of the firm about to acquire a knowledge of the world through travel is given the business as a secondary object, or a man is selected for his knowledge of languages, sociableness or good address. Such advantages are by no means to be despised, but are entirely subordinate to a thorough knowledge of the goods handled. Unless it is worth while to establish a local agency, it is advisable to do business through a commission firm, for under the prevailing conditions of the market and local business methods and customs, direct trade cannot be recommended. If it is desired to establish a direct trade, merchants should visit the country, study the market and select their own customers. Brazilian customers have good cause of complaint against many shippers on account of their negligence in carrying out instructions, their inattention to the Brazilian Customs regulations, and the carelessness with which Consular invoices are made out. All errors in these invoices even of a trivial nature or simple clerical errors, involve liability or result in fines, and as the Customs officers themselves profit from such fines, no explanation serves to evade them, and the consignee has on occasion to pay or advance double duties and fines and to suffer the consequent loss of time and extra work such errors entail. Inattention to these details is also a cause of loss of business, for customers refuse to repeat orders with firms through whose carelessness they have suffered. Customs dues are principally levied by weight, which includes not only the contents of the packages, but also the cases and packing. British packing is especially open to reform in the reduction of weight of the packages and packing, and in the more careful declaration of the same in the Consular invoices. Weights are divided into gross net, and real net. Gross weight includes the whole package including the outside casing or wrapping. Net weight includes the whole of the contents of the case, *i.e.*, the goods and the packing used inside the case. Real net weight is simply that of the goods or material itself without string, paper, cardboard boxes, &c. Should the real net weight in the Consular invoice include any packing, such an error cannot subsequently be altered without giving rise to a fine, and duties would have to be paid on the real net weight as declared in the invoice.

Reporting on the rubber trade, the Consul states that exports in 1907 and 1906 were as follows:—

1907	...	...	...	36,490 tons, £12,644,387
1906	...	...	...	34,960 tons, £13,899,809

The destinations of shipments in 1907 were as follows:—U.S.A., 16,811 tons; U.K., 14,354 tons; France, 2,506; Germany, 2,331 tons; other countries, 488 tons; total, 36,490 tons. Extensive demand, and the absence of competition in former years raised the price, and increased the output of Brazilian rubber. At the same time, expenses, freights, and taxation increased, and reduced profits. The increased production of rubber in other parts of the world, and the falling off in demand in proportion as prices rose, caused a reaction in prices. The financial crisis in the U.S.A. at the end of the year, and the consequent cancelling of orders had such disastrous results on the industry, that in view of the heavy expenses of output and taxation to which Brazilian rubber is subject, present prices do not give sufficient margin and shipments are consequently restricted. The following shows the decline in prices of fine Para rubber per lb.:—1905—May, 5s. 9¼d.; December, 5s. 5½d. 1906—December, 5s. 2½d. 1907—June, 4s. 7½d.; July, 4s. 11d.; September, 4s. 6d.; November, 3s. 3¾d. 1908—February, 3s.

San Domingo.—The British Consul at San Domingo reports that two wireless telegraphy installations are being set up on account of the Dominican Government by an American company. One is situated on the sea front in San Domingo, and will be of 20 kw.-power, and the other will be erected at Santiago de los Caballeros, one of the principal towns of the Republic, situated on the Central Dominican Railway, about 40 miles from Puerto Plata. This latter installation is only to be of 2 kw.-power. When in working order these wireless stations will communicate with San Juan de Porto Rica, Guantanamo, Jamaica and the receiving station on the Florida coast. If these stations work satisfactorily they should prove a source of gain to the Dominican Government, and will considerably injure the interests of the Cie Francaise des Cables Telegraphiques, which enjoys a monopoly in cable communication with Santo Domingo.

Spain.—The British Consul at Seville reports that the German electric company (Compania Sevillana de Electricidad) still has a monopoly of the electric lighting of Seville and of the tramway lines, but there will shortly be a competitor in the recently formed Co-operativa de Electricidad, which will soon have completed elaborate works in the province of Malaga. Both companies are putting up extensive plant, and offer to supply Seville and adjacent towns. The German company proposes to run tramways to two or three places within a radius of 10 miles. The new electric company will obtain power from a waterfall which they have acquired on the River Guadiaro. This project has the support of much local capital.

The British Vice-Consul at Cadiz reports that the town is lighted entirely by electricity, and novel lamps, especially such as give increased power of light without a corresponding increase in consumption, are always in demand. In this connection it may be mentioned with regard to openings for British trade, that merely a written inquiry accompanied by a catalogue is not likely to be successful with firms whose attention is engaged by a capable traveller representing a more enterprising house. British goods are everywhere admitted to be superior in quality, but it is often taken for granted that their prices are considerably above those of German and French brands. However, if only comparisons are carefully made, this will frequently be found not to be the case.

Bankruptcy Proceedings. — William Terrell Garnett, residing at Undercliffe House, Bradford, and carrying on business at Barkerend Mills, Bradford, as an electric cable and wire manufacturer.—At the Bradford County Court on Wednesday last week a receiving order was made in the case of the above debtor. Some time ago Mr. Garnett consulted his solicitors with a view to their arranging for a composition being paid. Negotiations were entered into, but, as the suggestion was not carried out, debtor was advised to file his petition. It is expected that the total liabilities will amount to about £94,000, the larger part of which is represented by loans from local bankers who hold security. The liabilities expected to rank for dividend are estimated at £35,000, and the assets will probably yield about £10,000. The debtor was formally a worsted spinner, and in the year 1895 he started business as a manufacturer of electric cables. The reason for the present state of affairs is understood to be losses in business coupled with depreciated value of freehold properties in which he was interested. October 7th is the date of public examination. The first meeting of creditors takes place at Bradford on August 26th.

Dissolutions and Liquidations.—The Egyptian Engineering Co., Ltd.—A meeting is to be held at 20, Tothill Street, Westminster, on September 17th, to hear an account of the winding up from the liquidator, Mr. H. K. Baynes.

Empire Electric Light and Power Co., Ltd.—August 31st is the last day for receipt of proofs for intended dividend. Liquidator, Mr. W. Allnutt, 5, Lime Street, E.C.

Thompson & Vanstone, ironmongers, electric and gas engineers, Exchange Street, Norwich.—Messrs. E. C. Thompson, H. Vanstone, and E. Roper have dissolved partnership, Mr. Thompson retiring. Messrs. Vanstone and Roper will continue the business as Thompson, Vanstone & Roper.

Blackpool Electric Tramways (South), Ltd.—This company is winding up voluntarily with Messrs. A. McGowan and J. McWilliam, of 43, Castle Street, Liverpool, as liquidators, who have authority to carry out an agreement between the company, the Blackpool, St. Anne's and Lytham Tramways Co., Ltd., Messrs. J. Heap and J. Harwood Banner, trustees of two trust deeds of the debenture stock of the two companies, and three others representing the various classes of debenture and shareholders in the company. A meeting of creditors is to be held on August 28th.

Hart Secondary Battery Syndicate, Ltd. (the old company).—A meeting is to be held at 4, Romford Road, Stratford, on October 7th, to hear an account of the winding up of this syndicate from Mr. J. H. Poulton, the liquidator.

Rubber Trade in French Congo.—The *Financial News* Paris correspondent says that advices from the French Congo state that a crisis has arisen in the india-rubber trade there. Exports are diminishing considerably, in consequence of higher prices, and fears are expressed by the authorities of the colony that financial uneasiness may follow.

Exhibition in Brazil.—On the 11th inst. the President opened the National Exhibition at Rio de Janeiro. According to Reuter, the Exhibition made an excellent impression. Several Brazilian States have constructed handsome pavilions, and the exhibits show the indisputable industrial progress of the country. Large numbers of visitors from abroad have arrived.

Electric Smelting in Canada.—In connection with the establishment of a plant at Nelson, British Columbia, for the electrical reduction of ores containing a considerable quantity of zinc, it is understood that a loan of $10,000 has been granted by the provincial Government to assist in the establishment of the works, which will probably soon be in working order.—*Commercial Intelligence.*

Catalogues and Lists.—Messrs. Berry, Skinner and Co., of 78, Upper Thames Street, E.C.—New eight-page list containing fully illustrated particulars with tabulated code numbers and prices and dimensional details of their various Berry's patent fool-proof ironclad switch and fuse gear.

Messrs. Scholes & Co., 4, Corporation Street, Manchester.—Small card relating to their electric heating apparatus.

The Electrical Co., Ltd., Charing Cross Road, W.C.—New leaflet drawing the attention of tradesmen to the "Aegma" lamps for shop lighting, also a novelty in the shape of a lamp with a revolving dial whereon one may ascertain the saving of money possible with these metal-filament lamps as compared to the ordinary carbon lamps. Also a hanging wall show-card without name for contractors' and suppliers' use, notifying that "Aegma lamps sold here save 75 per cent. in current."

Howard Asphalt Troughing Co., Ltd., Trafford Park, Manchester.—New catalogue (34 pages), in which they give full descriptive and price information concerning their system of troughing. The advantages of the latter are stated, and a good deal of additional information, not given in previous publications, is now included. Well illustrated instructions appear for laying the Howard troughing, for making a vertical bend, for mending a break, and for sealing rubber tails to cables laid in this system of troughing.

Messrs. A. P. Lundberg & Sons, 477-487, Liverpool Road, N.—Advance proof of a new 12-page publication giving particulars and prices in the firm's accustomed style, of their new pattern wall and floor connections. A number of diagrams show some adaptations of the "Tripin" connection.

Messrs. Fyfe, Wilson & Co., 74, York Street, Glasgow.—Illustrated leaflet describing and stating the costs of their paraffin and petrol engine sets for country house and other similar lighting installations.

British Insulated and Helsby Cables, Ltd., Prescot.—New pamphlet (p. 73) of 24 pages wherein their Prescot house fuse boxes, multiple pole type, are dealt with. The illustrations, which are very clearly shown, are numerous, and they depict switch cut-outs, fuse-boxes for non-hygroscopic and hygroscopic cables, for concentric and twin cables with asbestos-covered or porcelain bridge fuses, &c. Reference numbers, sizes, &c., are clearly arranged in tabular form.

Simplex Conduits, Ltd., London and Birmingham.—Twelve-page catalogue, very nicely illustrated and neatly arranged, showing a variety of their electric cooking and heating apparatus, including kettles with and without ornamental stands, water heaters, coffee machines, plate and food warmers, glue pots, electric irons, &c. Prices are stated.

"Midland" Condensing Plants.—The Midland Engineering Co., Ltd., Birmingham, have obtained the following orders within the last three months for their Zylberlast patent condensing and cooling plants:—

Dewsbury Corporation.—Cooling tower to deal with 50,000 gallons of water per hour.

Aston Manor Corporation.—Cooling towers to deal with 250,000 gallons of water per hour.

Wednesbury Corporation.—Cooling tower to deal with 5,000 gallons of water per hour.

Worthing Corporation.—Condensing plant to deal with 17,500 lb. of steam per hour.

The River Plate Electricity Co., Ltd. (through Messrs. W. H. Allen, Son and Co., of Bedford).—Cooling tower to deal with 110,000 gallons of water per hour.

Sherwood Colliery, Mansfield.—Cooling tower to deal with 110,000 gallons of water per hour.

Islington Corporation.—Cooling towers to deal with 370,000 gallons of water per hour.

Messrs. Bayliss, Jones & Bayliss, of Wolverhampton.—Cooling tower to deal with 20,000 gallons of water per hour.

Book Notices.—*The Universal Directory of Railway Officials*, 1908. 10s. London: The Directory Publishing Co., Ltd., 3, Ludgate Circus Buildings, E.C.—This is the fourteenth annual edition of what we have found to be a useful work. It is a directory of railways (with a note of their length, gauge, &c.) and railway officials, also of tramways in the United Kingdom, the information given having been compiled from official sources under the direction of Mr. S. R. Blundstone, the editor of the *Railway Engineer*.

American Street Railway Investments (1908).—Fifteenth annual edition. New York: McGraw Publishing Co.—This is the large red book containing very full particulars with maps, &c., of electric and other street railway undertakings in America, which is issued annually by the publishers of the American *Electric Railway Journal*. The information is compiled specially for the use of investors and all interested in investment matters of this description.

"Electric Lighting and Power Distribution." By W. Perren Maycock. Vol. I. Seventh edition. Whittaker & Co. 1908. Price 6s. net.

Lighting Exhibition.—We are informed that the practical demonstrations of modern methods of lighting and heating will be an attractive section of the Ideal Home Exhibition which is to be held at Olympia in October. The latest electric and gas devices for lighting, heating and cooking will be shown. The uses of acetylene will be demonstrated, as will also novel methods of lighting by means of petrol.

LIGHTING and POWER NOTES.

Aberdeen.—The question of adopting a different system of charging to the "maximum demand" is under consideration by a special sub-committee.

Acton.—The report of Messrs. Kennedy and Jenkin respecting the local electricity undertaking was presented at the Council meeting on Tuesday, its consideration being deferred. The report, which is of considerable length, reviews the present arrangement of plant, and the losses in distribution, conversion from alternating to direct current, in battery working, &c., it being shown that the department purchases in bulk from the Metropolitan Electric Supply Co. 65·8 per cent. more energy that it sells, to cover these losses. It is suggested that a serious mistake was made at the outset in choosing a direct-current system, when the bulk supply consists of alternating current. The report makes it clear that the only real improvement must come from an increased sale of energy in the district, and, in view of the low price quoted by the Metropolitan Co. in connection with a recent Bill in Parliament, viz., £5 per KW. of maximum demand plus ·35d. per unit, the report goes on to suggest that an effort should be made to induce the company to give the Acton supply at this price, which would have saved the Council £1,285 on the year 1907-8. It is of some interest to note that the Council installed a battery as a safeguard against failure of the Metropolitan Co.'s supply, and that such failures are stated to have occurred on a number of occasions.

Amble.—At a meeting of the U.D.C. on the 12th inst., Councillor Wanless proposed that the Council should take steps to adopt a complete system of electric lighting for the town. He said that owing to the high price of gas, 50 per cent. of the people had to use paraffin lamps. A suction gas generating plant could be put down for £5,500, which would necessitate an annual expenditure of £900, and against that they might safely count on an income of £1,100. He claimed that they could relieve the rates by from £160 to £200 per annum. It was agreed that the Council should form themselves into a committee to go into the matter fully.

Arbroath.—The electricity undertaking was publicly inaugurated on Wednesday, when Mr. George Balfour, the managing director of the company which has carried out the work, entertained a large party to luncheon.

The station is equipped with two Belliss & Morcom condensing engines, of 550 and 250 H.P. respectively, coupled to interpole generators supplied by Messrs. Thos. Parker, Ltd. A Worthington surface condenser is provided to work in conjunction with the engines; and an E.P.S. battery of 260 cells, together with booster and balancer sets, in conjunction with the electrical plant. The boiler house contains two Babcock & Wilcox boilers, and a separate pump room contains a Paterson feed-water purifier and two feed pumps. The supply is on the three-wire system, with 500 volts across the outers. Callender V.B. cables laid solid in earthenware troughing, the main feeders being triple-concentric, and the distributors single cables, have been used. The main streets are to be lighted by 20 Crompton Blondell flame arc lamps.

Blandford.—The T.C. has passed a resolution to the effect: "That owing to the unsatisfactory lighting of the town by the gas company steps be taken to inquire under what terms and conditions an electric light company would undertake the public lighting."

Bo'ness.—The T.C. has received sanction to the borrowing of £7,000 for additional plant at the power station. The Secretary for Scotland, in consenting to the loan, advises the institution of a reserve fund in connection with the undertaking.

Bridgend.—The U.D.C. has decided to apply for a loan of £8,250 for electricity purposes, and the provision of a refuse destructor.

Burton-upon-Trent.—The Electricity Committee has just decided to reduce the charge for energy for outside arc lighting from 5d. to 4d. per unit. The reduction applies only to arc lamps which overhang the public footway, and are on the exterior of the building when closed, and the only stipulation is that the wiring which supplies the arc lamps shall be continued to the Corporation's supply point—*i.e.*, the cut-out, so that a meter can be fixed there, which will be done free of charge and meter rent. This reduction has been conceded because the use of arc lamps—particularly flame arc lamps—assists in the illumination of the streets and generally benefits the town; these lamps also prove a very good advertisement for the electricity department.

Blair Atholl.—The Duke of Atholl has just introduced electric lighting into his Perthshire residence, Blair Castle, and the village of Blair Atholl. The reservoir from which power is derived is situated about two miles north of the Castle, and covers an area of three acres; this is connected to the power house by a 15-in pipe line. The power house is erected near the Castle, and three Pelton wheel-driven generators have been installed, one for the use of the Castle, one for the village, and one in reserve. It is fully expected the Glentilt district will yet be connected.

Canada.—The Ontario Government has awarded a tender for the construction of a main transmission line from the Niagara Falls power station, at a cost of $1,270,000.

Chalfont St. Peter.—The P.C., which is considering the best method of lighting for the village, has asked the Uxbridge Gas Co., the Uxbridge Electrical Co. and the Gerrards Cross and District Electrical Co. to give estimates of the cost of fixing lamps (the number of which is to be decided by a Council Sub-Committee) and all necessary fittings).

Chippenham.—The T.C. has accepted the offer of Messrs. Edwards & Armstrong, on behalf of a proposed company, to take over the Council's E.L. order. The Council is to have the option of purchasing the undertaking at the end of 21 years, to hold £100 worth of stock in the company, and to have a representative on the directorate.

Continental Notes.—ITALY.—At the recent general meeting of the Societá Anglo-Romana for the Illumination of Rome, the President Senator Cannizzaro informed the shareholders that they had during the preceding year sold the following number of units:—For lighting, 6,723,909; for traction, 8,619,759; for motive power, 9,274 015; for heating, 17,453.

Application has been made to the authorities of the province of Belluro for a concession to put down a plant to utilise the water-power of the river Ardo at Corontola in the generation of electrical energy for lighting and power purposes.

GERMANY.—On April 1st last there were 15,030 central electrical stations established in Germany, producing energy for public and industrial purposes, with a total capacity of 730,751 KW., with accumulators having an auxiliary capacity of 128,090 KW. Statistics show that 1,217 of the stations having a capacity of 243,022 KW. supply continuous current only, 129 of the stations with 152,659 KW. generate three-phase current only, the remainder generate both direct and three-phase energy; 669 of the stations are worked with steam only, 161 with water only, the rest with steam and water; two thirds of the central stations are the property of municipalities, and the remaining third belong to private companies. The largest undertaking is that of Berlin, with 138,700 KW., followed by that of Hamburg with 28,622 KW.

A central electric lighting station is shortly to be established in the town of Markt-Erlbach, Bavaria.

HUNGARY.—A recent canvass by the General Electric Co., of Budapest, Hungary, which supplies alternating current, shows that there are about 15,000 tungsten lamps installed on its lighting circuits, and it is estimated that the same number is in use on the circuits of the company supplying lighting service in that city by direct current, the total thus being about 30,000 tungsten lamps of various candle-powers.—*Electrical World.*

Crayford.—A Committee of the P.C. is to consider the question of lighting the parish by electricity. At the last meeting of the local authority, Councillor Hopper said that after a study of figures, he felt confident that the district could be lighted much better by electricity than by gas.

Ealing.—In reference to the summons by the Corporation against the Empire Palace (Ealing), Ltd., for supplying electricity in bulk to a restaurant on the theatre premises, occupied by Liptons, Ltd., the defendants have entered an appeal against the decision of the justices, in view of the fact that they ordered payment of costs against the company, although they dismissed the information.

Glasgow.—The town clerk has been instructed to bring under the notice of the T.C. Watching and Lighting Committee the recommendation of the Electricity Committee to reduce the charges for electricity for public street lighting purposes from £14 to £12 per 10-ampere double-carbon lamp, and from £12 to £10 per 7½-ampere double-carbon lamp, per annum, and to point out that the reduction will mean a saving to the Lighting Department of £1,650 per annum.

Gravesend.—The T.C. has applied to the L.G.B. for a loan of £6,000 for E.L. purposes.

Harwich.—Messrs. Foote & Milne have informed the T.C. that they intend applying for a prov. order for electric lighting.

Hindley.—The B. of T. has extended the U.D.C.'s electric lighting Order for a year from June 25th.

King's Lynn.—The profit on the works for the year ended March 31st last, after allowing for interest and sinking fund, was £563, as compared with £593 in the previous year. Last year's profit went towards clearing off the balance of losses on the early years of the undertaking, and the estimated surplus for the coming year was largely disposed of by a reduction in the charge for public lighting and a lowering of the charge to ordinary con-

sumers, from 5d. to 4½d. per unit. In spite of this, however, the profit on the year is nearly as large as in the previous year. The total sales of energy during the year amounted to 553,924 units, at an average price of 2·70d., as compared with 514,029 units, at an average price of 2·78d., in the preceding year. Out of the total mentioned above, 192,587 units were used for public lighting, at a charge of 1·85d. per unit. The works costs was ·944d. per unit, the total cost 1·247d and the total expenditure, including interest and sinking fund, 2·779d. per unit sold.

Kingston-on-Thames.—A L.G.B. inquiry was held on Tuesday into the application of the T.C. for a loan of £12,600 for electricity purposes.

London.—Poplar.—The 1907 annual report of the borough medical officer (Mr. F. W. Alexander) contains some interesting figures relative to the cost of electrolytic disinfectant. Between February, 1906, and January, 1908, some 32,586 gallons of fluid were manufactured, of an average strength of 4·5 to 5·0 grammes of chlorine per litre, the cost being £63 for materials and energy, including some £30 11s. for 4,888 units of electricity. The estimated cost of producing and supplying carbolic acid disinfectants during the same period (based on the experience in 1905) was £2,015, and this compares with £1,009, the actual cost with the electrolytic disinfectant, showing a saving in connection with the latter of £1,006 approximately.

Lowestoft.—The borough electrical engineer has been directed to submit a plan showing the suggested lighting by electricity of 14 streets, with the price per lamp and the cost of lighting each street. At the last meeting of the T.C. it was reported that the cost per lamp would not exceed the present cost per lamp for incandescent gas. A clause is to be inserted in free-wiring agreements providing for a minimum payment in all cases.

Macclesfield.—The Macclesfield District E.L. and Power Co., Ltd., has informed the T.C. that it intends applying to the B. of T. for a prov. order for E.L. The T.C. has asked the company if it is prepared to take over the Council's Order.

Newcastle.—Messrs. John Bowes & Partners are about to sink a new shaft at their Delight Colliery, Dipton. With the exception of the winding engine, the whole of the machinery will be electrically driven.

New Zealand.—Recently the City of Dunedin was deprived of its electric supply, owing to the breakage of some 50 ft. of fluming at the Waipori Falls Power Station. Fortunately the original steam generating plant was available, and this enabled the tramway service to be carried on.

Perth.—The Clerk to the Convention of Burghs has written to the Electricity Committee drawing attention to the fact that by means of arrangements with Scottish railway companies and private owners, non-statutory companies are taking steps to provide electric power and light in competition with the municipal and other authorised suppliers, and desiring that the Council should support the Convention in such action as it may take in opposing these arrangements. The Committee has resolved to support the action of the Convention as desired.

Peru.—Work has commenced again at the celebrated silver mines of Caylloma, on the eastern side of the Andes in Peru. The mines are situated at a height of 4,200 to 5,000 metres above sea level. In order to get there, a two days' journey on mules is necessary from the nearest railway. Two waterfalls, one with 42 metres, the other with 275 metres fall, will be used for the transmission of power, discharging into the Huail Lake. For the first fall a turbine will be used for continuous service, and for the second fall a Pelton wheel will be operated from time to time when wanted. The distance of transmission is about 5 km., at a pressure of 3,300 volts, reduced to 440 at the mine.

Rawtenstall.—The T.C. has declined to supply energy to the Haslingden Board of Guardians for lighting purposes at 3d. per unit, and the B. of G. has decided to ask its electrical experts to advise it on the question of providing its own installation.

South Africa.—The Simon's Town (Cape Colony) Municipal Council recently requested the Admiralty to consider an application for the supply of electric energy for street lighting from the Admiralty mains. The Commander-in-Chief has replied that there appears to be no objection to giving the supply asked for, subject to Admiralty approval being first obtained. It would be necessary to lay separate cables, and in the event of the Admiralty agreeing to such a supply, it was suggested that the Municipality should provide all necessary material to the satisfaction of the electrical engineer, and, as far as possible, do their own work in connection therewith, the necessary skilled labour being provided by the electrical engineer of the dockyard, and the cost charged against the Municipality. The cost of the current would, on the present basis, be 6½d. per unit. The Admiralty would reserve to themselves the right to discontinue the supply at any time at the discretion of the senior naval officer, and they would accept no responsibility for non-supply of current from any cause. The Council decided, at a meeting held on July 23rd, to leave the matter in abeyance.

Truro.—The T.C. has received from Messrs. Foote and Milne, Ltd., notice of their intention to apply for a prov. order for electric lighting.

TRAMWAY and RAILWAY NOTES.

Aberdeen.—At a recent meeting of the T.C. a letter was read from the London Electrobus Co. intimating that it proposed to apply for a license for opening in the city of Aberdeen a service of electric omnibuses on suitable routes—to be submitted to the T.C.—where the city is not served by an efficient electric tramway service. The letter was remitted to the magistrates for consideration.

Argentine.—The question of tubes in Buenos Ayres is again to the fore; the manager of the Amalgamated Railways has applied to Congress for a concession for the construction of an underground line to connect up Plaza Constitucion, Casa Amarilla and Retiro. This would give continuity between the Great Southern, Pacific and the Amalgamated lines. An overhead construction is altogether out of the question, and the only solution to the problem is by means of an underground line. The attempt of the Buenos Ayres Municipality to contract for the construction of tubes has been a failure.—*Review of the River Plate.*

Belfast.—On the forenoon of the 11th inst., the official inspection of the Queen's Road tramway extension was made by Lieut.-Colonel Druitt, of the Board of Trade. Lieut.-Colonel Druitt, who was accompanied by the Corporation and Harbour representatives, and heads of departments, went over the extension in about half an hour, and at the close of his tour expressed a favourable opinion regarding the work. It was taken into public use the following day, and is proving a great boon to the thousands of workers employed in the great ship-building yards at the Queen's Island. The extension is slightly over a mile in length, and in this comparatively short run there are no fewer than 36 diamond crossings and five cross-over roads. Overhead there are six collapsible spans to permit of boilers and machinery being lifted across the wires, and considerable alterations had to be effected in the gantries to enable double-decked cars to pass underneath. The lighting of the route is by cables, carried above the trolley wires. The work was carried out within four months and a half by the contractors, Messrs. Dick, Kerr & Co., although they had six months to do it in. Next month the same firm will take in hand the construction of a junction at Station Street and Bridgend.

Continental Notes.—Italy.—Messrs. Ganz, of Buda-Pest, have constructed a movable sub-station which can take the place of one of the fixed sub-stations along the Valtellnia Railway. The chamber is constructed entirely of iron, and contains transformers of 430 kw. It is divided into two compartments, the larger of which contains the high-tension apparatus, an electric fan to reduce the temperature of the iron, and a 20,000-volt oil switch, with lightning arresters and accessories. In the smaller compartment the secondary apparatus is arranged giving facilities for connecting three outgoing circuits which correspond to the number at Colico; to replace either of the other sub-stations only two circuits would be required. This movable sub-station is found very useful where repairs have to be undertaken to the existing fixed sub-stations.

A collision occured on Monday last between a small car from Rôme and a large car from Marino; the small car was driven into the interior of the larger one, both passengers and tramway servants being badly injured.

Dublin.—A movement is on for the introduction of the system of trackless electric tramways in Ireland, the first contemplated route being between Donnybrook, in the suburbs of Dublin, and the pretty seaside resort of Bray. The system, it is said, can be worked inexpensively on the existing roads from power derived from the usual overhead wires. The project has been submitted to the manager of the Dublin United Tramways Co., and to the County Council. The promoters claim a good return from small traffic, as there is no big sum sunk in the permanent way.

Ealing.—On behalf of the Board of Trade, Col. Yorke inspected the London United Tramway track, within the borough, last week. This is the third inspection which has been held, and neither it nor preceding ones appear to have been satisfactory to the local authority; as a result of the last one, the Mayor has forwarded an official protest to the B. of T.

Hampton.—The following Councils have been invited to attend a conference to consider the present condition of the permanent way of the London United Tramways and its method of construction, with the view to some united course of action being taken in order to obtain improvement:—The Town Councils of Ealing and Hammersmith, and the Urban District Councils of Twickenham, Chiswick, Acton, Brentford, Southall, Norwood, Teddington, Hampton Wick and Hounslow. A letter was received recently from the London United Tramways stating that it proposes to continue the work of repairing the permanent way within the Hampton district upon which workmen were engaged until everything needing attention should have been completed. The company also intimated an intention to place a new type of silencer in certain spring points. The District Council has resolved that the attention of the Metropolitan Police

Commissioner be again called to what they contend to be the unsatisfactory condition of a number of the cars of the London United Tramways, whereby considerable noise and annoyance to residents along the route is caused.

Hythe (Kent).—The National Electric Construction Co. has informed the T.C. that owing to the cost of the present tramway scheme, it would be practically impossible to raise sufficient capital. For certain reasons given to the Council, the company has decided not to adopt the surface contact system for the tramways when laid. The Council, at the request of the company, has consented to the abandonment of the Dolter system, and to the adoption of the overhead system. In order to lessen the cost of the scheme, the Council has also consented to the terminus being in Twiss Road in lieu of Market Street, thus avoiding expensive street widening in High Street.

London.—According to recent reports, a portion of the Brighton Co's. electrified route, between Peckham Rye and Battersea Park Road, will be completed by the end of September, when trains will commence running. The fares will be unaltered.

Maidenhead.—A proposal has been made to run a tramway along the roads from Windsor to Maidenhead and on to Henley. As far as Maidenhead is concerned, it is certain that the provision of tramways cannot be much longer delayed. The need increases with passing years, and there would seem little doubt that a tramway scheme linking the Littlewick and Maidenhead Thicket district with the business part of the town, and also with the riverside and Cookham and Bray as well as with Marlow, Henley, Holyport and Windsor would prove a popular concern.

Perth.—The burgh accounts just published show that there has been a total deficiency since the acquisition of the tramways five years ago of £5,860; last year alone the loss was £1,264, and to meet this and other past deficiencies, the tramway rate imposed last year realised £1,928.

Queensland.—The Executive Council has granted a loan of £25,000 to the Rockhampton City Council for the construction of tramways.

Rochdale.—On Wednesday a conference was held of representatives of the Whitworth District Council and the Rochdale Tramways Committee, as to the extension of the Rochdale system of tramways to the Red Lion, Shawforth. The Rochdale members submitted terms on which the Corporation will be willing to work the extra length, and these have been favourably received. It is generally felt that there should be no difficulty in coming to a mutually satisfactory agreement. The Local Government Board has sanctioned a Rochdale Corporation loan of £1,600 to cover the cost of widening Bolton Road, Sudden.

Southend.—On Monday last the new extension of the Corporation Tramways, from the Kursaal to Bryant Avenue, was inspected by Col. von Donop, and subsequently opened for traffic.

Sunderland.—At the meeting of the T.C. on the 12th inst., there was on the agenda a motion by Alderman J. Turnbull—"That a special committee be appointed to take into full consideration the present position of the Corporation electric lighting undertaking and report its findings to the Council. That the said committee be empowered to call in such expert and financial advisers, and to take such evidence as they deem necessary. That no member of the Electric Lighting Committee be appointed on the said special committee." As the meeting decided that this motion must be taken before Alderman Bruce, chairman of the Electricity Committee replied to the discussion of last month, Alderman Turnbull asked the leave of the Council to withdraw it, as he wished to make an alteration in it. There was some dissent to this proposition, but the Alderman declined to move it before Alderman Bruce had replied, consequently the motion was not dealt with.—Alderman Bruce then replied to the criticisms of the annual report. He said that with regard to the supply of electricity to the tramways, he would very much rather discuss that with the Tramways Committee. He was asked to account for £5,000 which, it was said, at the last meeting, the tramways were paying in excess of other towns. The sole reason of that cost to the tramways was that the plant in the Dunning Street station was put there by the Tramways Committee's engineer on the authority of the Council. It was put there to be used for the tramways and it never had been, nor would be possible to use it for any other purpose. The production of electricity at Dunning Street was expensive as compared with the newer station, but since that plant was put down for tramway purposes the capital charges must always be upon the cost per unit for tramway purposes. They could supply more cheaply at Hylton Road, where they had installed turbines, but he was sure the Council would not hear of them scrapping the Dunning Street plant, and going to the expense of getting new plant. Dealing with the special circumstances of the year, he referred to the great decline in the shipyard load owing to the depression of the shipbuilding industry, and said he had no doubt but that in the course of 18 months or two years at most, that load would come again. As to the financial position of the undertaking, he pointed out that the total capital was £403,295, and they had a gross profit of £22,978, which was equal to 5·69 per cent.. Mr. T. Summerbell, M.P., the chairman of the Tramways Committee, objected to the manner in which Alderman Bruce had put the responsibility for the plant at Dunning Street on the Tramways Committee. Dunning Street station was devised and constructed by, and was the property of, the Electricity Committee. The Tramways Committee was not responsible for the plant that was put down there.

Taunton.—The T.C. has decided to renew its agreement with the local tramways company as to power supply, on condition that the latter constructs and opens an extension to Rowbarton within six months' time. The supply will be at the present rate until the new section is opened, after that date it will be charged at 1·2d. per unit, with a minimum payment of £600 per annum.

TELEGRAPH and TELEPHONE NOTES.

Australia.—The chief Commonwealth electrical engineer (Mr. Hesketh) estimates that to meet public requirements in connection with telephone and telegraphic works during the next three years, £2,100,000 will be required. The question of arranging a financial system by which the Postal and Telegraphic Department might more conveniently secure the money it requires to carry on its services, is to be considered. Each State will benefit as follows:—New South Wales, £900,000; Victoria, £700,000; Queensland, £160,000; South Australia, £140,000; Western Australia, £140,000; Tasmania, £60,000. It would not include provision for such undertakings as telephone exchange buildings, but it would be expended in revenue-producing works.—*British Australasian.*

Hampton.—At the last meeting of the District Council, the clerk reported that he had invited the U.D. Councils of Hampton Wick, Twickenham, Teddington, East Moseley, and Sunbury to attend a conference on the proposal of the Postmaster-General to extend the telephone system in the district, and for that purpose to construct overhead lines, with a view to uniformity of action on the part of the Councils interested in the case of the present and of any subsequent similar applications. It was decided that the Postmaster-General be informed, in reply to his application for a general consent, that each case will be treated on its merits.

International Congress of Telegraph and Telephone Engineers.—On September 21st next the first International Technical Congress is to be opened at Budapest. The proposal to hold the Congress emanated from the French Administration, and was supported by the Hungarian Administration; the technical staff of the latter succeeded, with the support of their Minister and their Director-General, in arousing the interest of other Administrations, of which the following are sending delegates to the Congress:—England, France, Germany, Bavaria, Austria, Italy, Belgium, Holland, Denmark, Sweden, Roumania, Bulgaria and Servia. A series of highly interesting papers will be distributed to the members before the opening of the Congress in English, French, or German, and the discussions are to be held in these languages. Arrangements have been made by the technical staff of the Hungarian Administrations to enable the members to visit the various installations at Budapest, as well as the large electric plants and the factories where telegraph or telephone material is produced. The Congress will meet at the premises of the Hungarian Engineers' and Architects' Association, and the Hungarian Committee entrusted with the arrangements will shortly distribute the detailed programme of the Congress. Those who are interested in the Congress should apply for information to Mr. Endre Kolossváry, Chief of the Technical Department, Direction-General of Posts and Telegraphs, 11, Albrecht ut 3, Budapest.

Paris—Cologne Telephone.—Arrangements have been made for establishing direct communication by telephone between Paris and Cologne. The work will be begun at once.

Telegraphic Interruptions and Repairs:—

Cables.	Interrupted.	Repaired.
Curacao-Coro Curacao-La Guayra Curacao-Maracaibo	Closed	Jan. 12, 1906 .. ..
Tarifa-Tangier	..	Jan. 18, 1904 .. ..
Port Arthur-Chifu (Closed)	..	Mar. 9, 1904 .. ..
Las Palmas—Arrecife	..	May 18, 1908 .. ..
Pera-Dardanelles	..	May 20, 1908 .. ..
Sierra Leone-Accra	..	May 28, 1908 .. ..
Kwandang-Menado	..	Aug. 5, 1908 .. ..
Djedda-Souakim	..	July 27, 1908 .. ..
Assab-Massouah	..	July 28, 1908 .. ..

Telegraph Men in Camp.—The *Times* states that the Welsh Divisional Telegraph Company, under Captain T. A. Isaac, after being encamped at the back of Government House, Farnborough, for a fortnight, broke camp last Saturday. Its members are all drawn mainly from the Cardiff postal and telegraph departments, and, although actually following their own vocations while under canvas, they have found much that was new to them in the Army methods of telegraphy. The earlier portion of their training was passed principally in cable-laying by hand, but with the experience gained in 12 days they felt justified last Friday in attempting to lay cable from a horsed wagon. The attempt was successful, and, with the horses travelling at a trot, the telegraphists laid six miles of cable, and established communication between field telegraph stations several miles apart. Captain Isaac says he feels assured that within a short time his command will be far more efficient than any telegraph company could have been made under the Volunteer system.

Wireless Telegraphy.—The United Wireless Telegraph Co. has established a station at the Ten Eych Hotel, Albany. The company also intend establishing a system on the Hudson River boats performing the day service, as well as on the boats of the Albany Co. who perform the night service. The *Telegraph Age* states that the United States signal service will include in its equipment a device embodying complete wireless telegraph outfits which can be carried by two mules. It is hoped to be able to communicate 15 miles by means of this device.

It has been proposed by Mr. Hunt, the Australian Commonwealth Meteorologist, that, in addition to the wireless receiving stations to be established by the Government on the coast which can obtain weather reports from ships in the Indian and Southern Oceans, a sending and receiving station should be built on Amsterdam Island, situated about midway between the west coast of Australia and the southern extremity of Africa. The island is in an almost direct line between Tasmania and Cape Town, in the midst of a vast oceanic space where weather systems are formed and storms are generated.

Wireless Telephony.—As a result of experiments extending over several months, three French naval lieutenants last week succeeded in establishing communication between the Eiffel Tower and Dieppe, some 90 miles distant. They followed this by an attempt to communicate with the wireless station at Raz Cape, in Brittany, some 310 miles from Paris, and, it is stated, with some measure of success. The Italian Prof. Magorsna's wireless telephonic system between Monte Mario and Porto Danzio, some 60 km., is also reported to be giving excellent results.

Wireless Time Signals.—It has been suggested to the French Academy of Sciences that by international arrangement a special wireless signal could be sent from the Eiffel Tower precisely at midnight, Paris time, and this signal, being received upon ships far out at sea, would furnish navigators with an invaluable check upon their chronometers by giving them the exact hour at a known point on the earth.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—PERTH.—October 6th. The Postmaster-General requires tenders for various telegraph and telephone material. Particulars may be obtained at the Commonwealth Offices, 72, Victoria Street, Westminster, S.W.

TASMANIA.—November 2nd. The Postmaster-General requires tenders for material for accumulators and equipment for telegraph purposes.

Austria-Hungary.—September 3rd. Municipality of Nagy-Kanizsa. Installation of electric plant for the lighting of that town. The contract is to be:—(1) For the erection of the necessary buildings; (2) for the mechanical fitting up of the electric plant; (3) for the necessary supply of water power; (4) for the electrical installation; (5) for the necessary materials for secondary installation (secundärinstallácziók). Plans, conditions of tender, &c., may be obtained on application at the office of the town engineer (Varosi Hernoki Livatal, Nagy-Kanizsa) at a cost of 150 crowns (£6 5s.). A copy of the notice inviting tenders (in Magyar) may be seen by British contractors on application at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C.

Belgium.—BRUSSELS.—August 28th. The municipal electricity department requires a number of air compressors. A deposit of £20 is required, and tenders may be obtained from the Echevin at the Hôtel de Ville on payment of 5d.

BRUSSELS.—September 2nd. Tenders are required by the company for narrow gauge railways (Société National des Chemins de fer Vicinaux), for the supply and laying of electric cables, ducts, &c., for the equipment for electric traction of the section Brussels to Grimberghen of the Brussels-Humbeek railway. Specifications Nos. 11 and 51, 1908, may be obtained on payment of 10d. each, and plans at 12s. 10d., at 14, Rue de la Science, Brussels.

Bolton.—August 27th. The Electricity Committee invites tenders for the supply of 25,000 tons of bituminous engine slack to be delivered at the electricity works, Spa Road.

Cairo.—September 12th. The Railway and Telegraph department requires tenders for various material.

Dublin.—September 4th. 500 single-phase and 100 three-phase A.C. meters for the Corporation. See "Official Notices" to-day.

Edmonton.—August 26th. Electric lighting installation at the Nurses' Home for the Guardians. See "Official Notices" July 31st.

Farnworth.—August 27th. Motor-generators, rotor converters, switchgear, transformers, &c., for the U.D.C. See "Official Notices" August 14th.

France.—August 25th. Material for the manufacture of submarine cables for the Ministry of Public Works, Posts and Telegraphs (50 km. and 100 km. submarine cable core, also iron wire, jute thread, &c.). See *Board of Trade Journal* August 20th.

Hull.—August 26th. Pipework for the Electricity Department. See "Official Notices" August 14th.

London.—September 7th. General Post Office. The Postmaster-General invites tenders for the supply of telegraph poles. Particulars from Mr. G. Morgan, Controller of Stores, Stores Department, G.P.O., 17-19, Bedford Street, London, W.C.

METROPOLITAN ASYLUMS BOARD.—September 1st. Storage battery, booster, switchboard, &c., for the training ship *Exmouth*. See "Official Notices" July 31st.

L.C.C.—September 8th. Cables, cable-boxes, &c., for East Greenwich generating station and Woolwich Road car depôt; electric wiring for car depôt; switchgear; and six 500-KW. and one 150-KW. motor-generators, for the L.C.C. See "Official Notices" August 7th.

HACKNEY.—August 31st. Electric light and power fittings, also bell and telephone installation for Pavilion "B" at Homerton Infirmary for the Guardians. For plans see Clerk of Works on site (High Street Homerton).

Russia.—September 14th. The Town Clerk of Odessa (Upiawa) requires tenders for a concession to erect and work a power and lighting supply. A central station of a minimum of 6,000 H.P. is to be erected and equipped.

Soller.—September 5th. The municipal authorities of Soller in the Balearic Islands will adjudicate upon tenders for installation, maintenance and exploitation of electric lighting for 15 years from November 1st, 1908. A small deposit of 370 pesetas is required.

Spain.—August 31st. The municipal authorities of Monbelstran (Province of Avila), are inviting tenders for the concession for the public and private electric lighting of the town. Particulars may be obtained from, and tenders are to be sent to, El Secretario del Ayuntamiento de Monbelstran (Avila).

Tenders have lately been invited by the municipal authorities of Ribadeo (Province of Lugo), for the concession for the public and private electric lighting of the town during a period of 15 years.

Spezio.—August 28th. About £400 of electric lamps are required for the equipment of men-of-war at the Arsenal at Spezio.

Stretford.—The U.D.C. invites tenders for steam boiler, economisers, and mechanical stokers for the electricity works.

Watford.—September 1st. Surface condenser and pumps for the U.D.C. See "Official Notices" July 31st.

CLOSED.

Blackburn.—The electrical fittings, &c., for the new Council School, being erected in Accrington Road, Blackburn, by the local Education Committee, are being supplied and fixed by Mr. Thomas Barton.

Denny.—The following tenders were received for the first part of the scheme for the electric lighting of Denny and Dunipace:

British Insulated and Helsby Cables, Ltd. (accepted)	£764
Callender's Cable and Construction Co.	835
Johnson & Phillips, Ltd.	851
Lowdon Bros. & Co.	923

Dolgarrog.—The contract for installing the electric light at the works of the British Aluminium Corporation at Dolgarrog has been let to Mr. H. Willoughby Lance, of Llandudno. The contract includes wiring for 38 arc lamps; and we understand that, owing to the difficulty of obtaining lodgings in the district, the men are camping out.

Dundee.—The tender of Brecknell, Munro & Rogers has been accepted, at £68, for certain overhead equipment in connection with the new generating station at Carolina Port.

France.—The French Post and Telegraph authorities in Paris have just given out contracts as follows:—Les Trefileries du Havre, 60 tons of bronze wire, 1·1 mm. dia., at 3,090 fr. per ton; and 60 tons of high-conductivity copper wire, 2 mm. dia., at 2,370 fr.; and La Compagnie Francaise des Metaux, Paris, 50 tons of bronze wire, 1·5 mm. dia., at 3,040 fr. per ton.

Glasgow.—The T.C. Electricity Committee has accepted the following offers:—

Pair of patent feed pumps at St. Andrew's Cross station.—Messrs. G. & J. Weir, Cathcart, £280.

Extension of rotary converter, with transformers and spares.—The British Westinghouse Electric and Manufacturing Co., Ltd., £851.

Induction motors and transformers.—Siemens Bros. Dynamo Works, Ltd., £1,565.

Switchgear in connection with rotary converter and transformers.—A. Reyrolle & Co., Ltd., £284.

Coal transporter for Port-Dundas station.—Temperley Coal Transporter Co. £2,620.

Coal tank, girders, &c., for ditto.—Messrs. Donald Clark & Son, Ltd., £580.

Tirrill regulators for Port Dundas and St. Andrew's Cross stations.—The British Thomson-Houston Co., £1,680 10s.

Liverpool.—Messrs. J. R. Norris & Co., of Oldham, have secured the contract for the electric lighting at the Liverpool Institute.

London.—The G.P.O. has accepted the tender of Siemens Bros. Dynamo Works, Ltd., for the supply of tantalum lamps.

Lowestoft.—The T.C. Electric Light Committee has accepted the tender of Parrish & Durrant, Lowestoft, at 7s. 6d. per point, for free-wiring work, and that of J. W. Brooke & Co., Ltd., also of Lowestoft, at 33s. 6d. per post, for the supply of 50 lamp-posts. The tender of Melloine & Goulder, Ltd., Ipswich, has been accepted for the supply of Eastwood nutty slack at 10s. 9d. per ton up to 1,500 tons. From E. Foster & Co., Adelphi, W.C., 1,000 tons of Ibstock large steam coal is to be ordered at 14s. 5d. per ton, and from Bradbury & Co. 500 tons of cobbles at 14s. 11d. The question of coal contracts is to be further considered at a later date.

Mossley.—The T.C. has accepted the tender of Messrs. Morrison & Roebuck, of Blackpool, for installing the electric light at the Mechanics' Institute.

Perth.—Westwood & Sons have secured the contract for the lighting of the new Northern district school, to cost £16,000. Their offer was £218.

Sunderland.—The T.C. has accepted the tender of the British Westinghouse Electric and Manufacturing Co., Ltd., for the supply of extra-high-tension switchgear for the Hylton Road station.

CONTRACTORS' COLUMN.

[The following information is published in the interests of electrical contractors and others who are seeking for openings for new business. Considerable expense is incurred in the production of this column, and every care is taken to ensure that the information is new and accurate, but it will be understood that in a matter where so many correspondents are engaged, and where the amount of information to be handled is very large, this cannot always be guaranteed. If alleged inaccuracies are reported to the Editors, they will be fully investigated.]

ABERDEEN (Methlick).—New public hall. Mr. Cobban, Haddo House estate architect.

ALFRETON.—Villa at South Normanton. J. Tomlinson, architect, South Normanton.

ALSAGER (Staffs.).—Town hall and public buildings contemplated.

APPLEBY.—New schools for Westmoreland C.C. (£4,500). Jas. Hartley, architect, Skipton, Yorks.

ARNOLD (Notts.).—Houses, Furlong Street and Marlborough Road; alterations to the Cross Keys Inn, Front Street. Baptist Chapel in Cross Street; W. H. Higginbottom, Friar Yard, Friar Lane Nottingham.

ASCOT (Sunningdale).—Two large villas on the golf links. Norris & Co., Sunningdale, and J. Wakelin, Sunningdale, builders.

ASHFORD.—Two houses, William Road, for E. J. Bowles; and four houses, James Street, for Mr. Burra; houses, Hunter Road, Willesborough, for Earl and Bailey; residence at Bethersden for Mr. Martin.

BARNSLEY.—Business premises in Eldon Street, for J. Lodge. E. W. Dyson, architect, 10, Regent Street, Barnsley.

BARTON-ON-HUMBER (Ulceby) — New Wesleyan Methodist Church (£1,550), and adaptation of old building for Sunday schools.

BEDALE.—Residence. S. T. Jones, Wycar, Bedale.

BELEEK.—New parochial house. W. O'Kane, builder, Bundoran.

BERWICK-UPON-TWEED.—Farm house at White Dam Head Farm for the T.C. Gray & Boyd, architects, 3, Ivy Place, Berwick.

BICKERSHAW (near Wigan).—Early developments at Junction and other local collieries. Pearson and Knowles Coal and Iron Co., Ltd., Warrington.

BIRKDALE.—Houses, Cardigan Road, for C. E. Howarth; Mill Lane, Ainsdale, for J. Cope; Hatfield Road, Ainsdale, for Campbell and Fairhurst.

BIRKENHEAD.—Alterations and additions to the Infectious Diseases Hospital at Claybrick.

BIRMINGHAM.—Extension of Hunningley Lane Ebenezer Sunday School.

BIRSTALL (Yorks.).—Presbytery, Kirkgate, for Rev. Father Russell.

BLACKBURN. — Increased office accommodation at Garden Street Mill. Garden Street Manufacturing Co.

BLACKHEATH (near Dudley).—Congregational Church. A. T. Butler, architect, Cradley Heath; J. M. Tate, builder, Cradley.

BLACKPOOL.—Pending developments and alterations at Raikes Hall Hotel for W. Tong & Son, brewers, Bolton. United Methodist Church in Shaw Road, South Shore; H. Wade and B. Walton, joint architects, 27, Burley Street, Blackpool.

(Fleetwood). — New ward at the Fleetwood Cottage Hospital. B. Drummond, architect, 54, Alfred Terrace, Fleetwood.

BLAINA (Mon.).—New Forward Movement Hall. Habershon & Fawckner, architects, Newport; W. Jenkins, contractor, Blaina.

BOLTON.—Four houses in Chorley Old Road, A. P. Patterson; new cotton shed for the Swan Lane Spinning Co., Ltd.; proposed additional baths, Corporation; alterations to premises, Knowsley Street, for Burgons, Ltd., tea merchants and grocers.

BOSTON.—Houses, Hartley Street, for H. Clarke; additions to house, South Square, for Miss Matthews; new Primitive Methodist Church at Bicker.

BOURNEMOUTH.—Restoration, after fire, of the Lion Brewery; proposed new school at Westbourne, for the Sussex Education Committee.

BRANCEPETH (Co. Durham).—Ten cottages for the New Brancepeth Co-operative Society. T. T. Shevels, Secretary.

BURRY PORT (Carnarvonshire).—New Co-operative Stores (£1,046). Brown, Thomas and John, builders, Llanelly.

BURSLEM.—Block of shops, Queen Street, for F. Wilson. E. T. Watkin, architect, Swan Chambers, Burslem.

BUSHEY (Herts.)—House, Aldenham Road, for Miss Griffin.

CADLE (near Swansea).—Additions and alterations to the Council school. T. Mansel Franklen, clerk to the County Council, Council Offices, Westgate Street, Cardiff.

CALSTOCK (Cornwall).—New United Methodist Church.

CARDIFF.—House, Amesbury Road; W. H. Scott, architect, Cardiff Congregational Chapel, Penywain Road; Habershon, Fawckner and Co., architects, Cardiff.

CASTLETON (near Rochdale).—Mill extension. Tweedale & Smalley.

CHATHAM.—Houses, Rochester Terrace, for E. Graham; house, at Luton, for Rev. A. Ralph; dairy, Gibraltar Farm, for H. Gurr & Son; rebuilding of premises, New Road, for F. Clark.

CHEADLE (Cheshire).—Engine house and battery room at the Warehousemen and Clerks' School; houses, Hulme Hall Road, Cheadle Hulme, for J. Waine; houses, Victoria Avenue, for Westcott and Shorland Ball.

CHESTERTON (Cambs.).—Houses, Aylestone Road, for C. W. Clark; Garden Walk, for L. Finch; George Street, for H. C. Buttress.

CHIPPENHAM.—Business premises, The Bridge, for Foreman & Sons, tailors, Warminster.

CHORLEY.—Shops and houses, Spendmore Lane, Coppull, for H. Baxter conversion of St. Lawrence's Lodge, Market Street, into club house, for the Conservative Club Buildings, Ltd.

CLITHEROE.—New secondary school, for the Education Committee (£14,000).

COLWALL (near Malvern).—New Church and Institute (£3,000). J. Stallard, Mayor of Worcester, secretary.

COTTINGHAM (near Hull).—Proposed new offices, fire station and surveyor's residence, for the U.D.C. J. H. Hanson, Surveyor to the U.D.C., Market Green, Cottingham.

CUMNOCK (Ayrshire).—Recreation and reading room, by the Marquis of Bute. Secretary, Reading Room Committee, Cumnock.

DARLINGTON.—Houses, Belvedere Road, for the executors of J. Oliver; Elton Parade, for A. W. Roberts; Langholm Crescent, for J. Culley; Falmer Road and Grasmere Road, for Martin Meehan; Marshall Street, for Clark & Moscrop; science classrooms, "Southend," Coniscliffe Road, Clark & Moscrop.

DERRY.—New schools for Christ Church.

DINNINGTON (near Rotherham).—Houses, Lorden's Hill, for Edwards and Robinson; Dee Lane, for Mr. Drabbell; Dinnington Lane, Anston, for B. Doe.

DONCASTER.—Primitive Methodist Church and Sunday schools at Brodsworth (£1,500).

DORCHESTER.—Infectious Diseases Hospital enlargement scheme.

DUDLEY.—Extension of the Grammar School. A. Morton, Clerk to the Governors, Birmingham Road, Dudley.

DUNBLANE (Perthshire).—Chapel for Queen Victoria School. A. Hay & Co., measurers, 44, Castle Street, Edinburgh.

DUNDALK.—Restoration of St. Patrick's Cathedral.

DUNDEE.—Alteration on shop, for F. J. McKenzie, Nethergate; houses in Blackness Avenue and Seymour Street, for T. M. Cappon; new central reading room (£12,000); Mr. Thomson, city architect. New school in Dens Road; J. H. Langlands, architect, Dundee.

DUNFERMLINE.—Proposed new primary department at High School. Clerk to the School Board, Dunfermline.

DURHAM.—Jewish Synagogue in Laburnum Avenue; houses, Highwood Road, for E. Almond.

DUNSTABLE.—House, West Parade, for Jas. Sharp.

EASTBOURNE.—Proposed alterations and additions to the Sussex Hotel. Enlargement of Holy Trinity Church (£7,000); Rev. G. P. Bassett-Kerry, vicar.

EDINBURGH.—Five tenements in Dunrobin Place and Teviotdale Place; Edinburgh Co-operative Building Co. Nurses' home at the Deaconess' Hospital, Brown Street. Eighteen flatted villas off Portobello Road, Duddingston Estate; A. Miller.

EGERTON and EAGLEY (near Bolton).—Pending mill developments. J. and P. Coats, Ltd., Paisley.

EGREMONT (Cheshire).—Row of semi-detached villas in Parkside. Roberts and Waugh, builders, Bulkeley Road.

FALMOUTH.—Seven houses for Eva and Bone.

FARNBOROUGH (Kent).—Children's Home at the Workhouse, for the Bromley Guardians. J. Ladds, architect, 93, Pemberton Road, Harringay, N.

FARNBOROUGH (Hants).—House and shop, Victoria Road, for H. Kingscote; additions to Salesian Institute, Queen's Road, Scoles and Raymond.

FARNWORTH (near Bolton).—Destructor buildings and extension of the electricity works. W. J. Loman, engineer, 11, Fold Street, Bolton.

FELIXSTOWE.—Houses, Station Road; R. W. Pratt, builder. Additions to post office; Thos. Ward, builder, Cliff Works, Felixstowe.

FLEET (Hants).—Extension of buildings in Kent Road, for the Whiteley Exerciser Co.

FRINTON-ON-SEA.—Houses, Second Avenue, for A. E. Wheeler; Cambridge Road, for C. H. Jones; Fourth Avenue, for S. Tench; Second Avenue, for Colonel H. S. Fleming; Harold Grove, for R. Bambridge.

FROSTERLEY (Co. Durham).—Two houses. J. Gardener, Victoria Cottages, Frosterley.

GAINSBOROUGH.—Refuse destructor buildings. S. W. Parker, engineer to the U.D.C., Council Offices, Gainsborough.

GARMOUTH (Morayshire).—Alterations at Garmouth Public School. J. Wittet, architect, Elgin.

GILLINGHAM (Kent).—House, corner of Garden and Manor Streets, for Dr. J. G. Taunton; houses, Rainham Road, for Mr. Brunnen, and Clifford & Co., estate agents, 43, Balmoral Road, New Brompton.

GOSPORT.—Enlargement of St. Faith's Church, Alverstoke.

GRANTHAM.—Houses, Harrowby Road, for T. Barlow; South Parade, for F. Robertson; Victoria Street, for G. Henson; auxiliary power house, for R. Hornsby & Sons, Ltd., engineers; additions to premises for the Co-operative Society; bakehouse, 5, London Road, for the Executors of Mr. Hornsby.

GREAT CROSBY (near Liverpool).—Houses, Hall Road West, for Mr. Bremner; corner of Kelvinside and Myers Road East, for C. Townsend; detached residence and stables, Hall Road East, Costain & Sons, builders, Byron Road, Blundellsands, Waterloo, Liverpool.

HALESOWEN.—Important colliery development by N. Hingley & Sons, with electrical equipment; sinking being carried out by Wainwright Bros., Princes End and Sedgley.

HALIFAX.—Offices for the Equitable Benefit Building Society and the Equitable Bank, Ltd. R. Horsfall & Son, architects, 22a, Commercial Street, Halifax.

HANLEY.—Four houses, Baskerville Road; W. Sargent. Alterations to premises in Ashley Street, for Boyce & Adams. Office in Mayer Street; Messrs. Ogden & Co. Seventeen houses in Cromwell Street; S. J. Simpson. Ten houses in Birches Head Road; E. Roberts.

HARPENDEN.—Mission room, Kinsbourne Green; gift of Sir Julius Wernher.

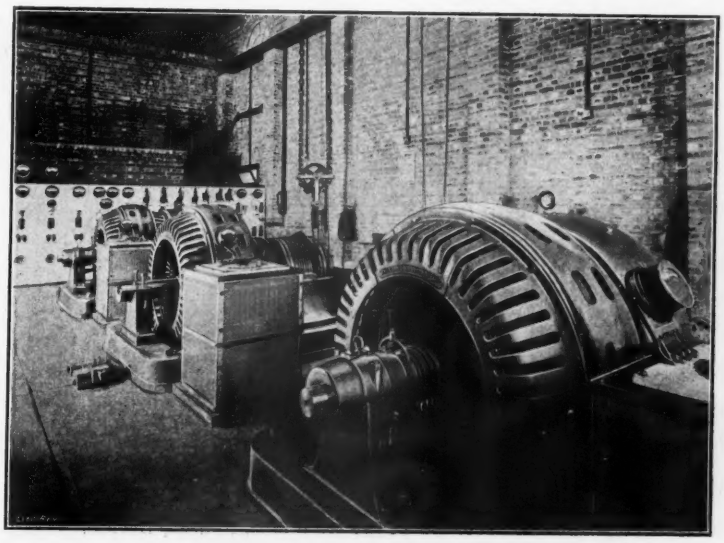
(*Continued on page* 304.)

ELECTRICAL DEVELOPMENTS AT DURBAN.

(FROM OUR SPECIAL CORRESPONDENT AT DURBAN.)

In our issue of February 10th, 1905, we gave a description of the Natal Government Railway Electrical Installations; since that time considerable developments have taken place, which have been brought about by the unification of the railway and harbour departments at Durban.

The railway power station recently built, being of ample dimensions to allow for the necessary additions to the plant, it was decided to close down the harbour station and place the control of the whole supply under the management of the Government electrical engineer, Mr. F. W. Mills, who drew up the necessary specifications for the additional plant.

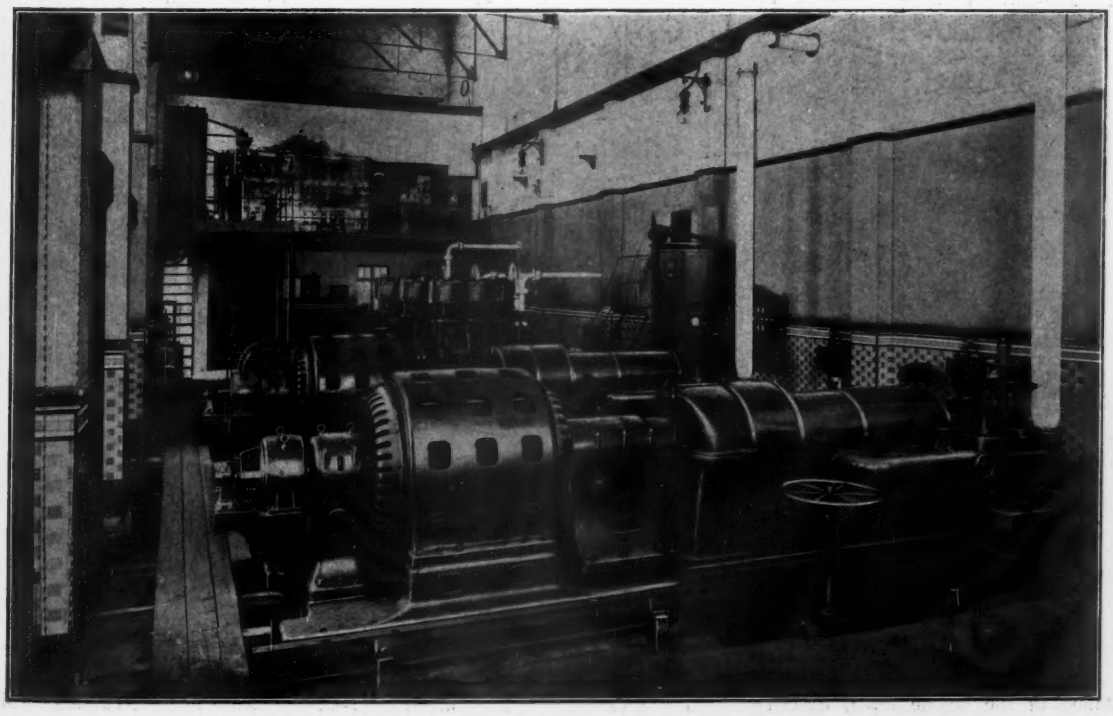


View in the Bluff Sub-Station, Showing Bruce Peebles Motor-Converters

Tenders were invited in due course, that of Messrs. Hubert Davies & Spain (now Hubert Davies & Co.), of Durban, Johannesburg and London, being accepted for the turbo-alternators, condensing plant, switchboard, and all sub-station equipment; and of the British Insulated and Helsby Cables, Ltd., for cables and switch boxes.

Additions were made to the boiler house plant by installing two Hornsby "upright" boilers taken from the harbour station; these boilers are rated at an evaporative capacity of 8,000 lb, and are fitted with internal superheaters, and mechanical stokers of the Hodgkinson "coking" type.

The engine room additions consist of two turbo-alternators, the turbines being of the Willans-Parsons make, coupled to generators by Bruce-Peebles; each set has a capacity of 940 K.V.A., and is provided with a separate exciter, fixed to an extension of the bedplate.



Willans-Bruce Peebles Turbine Plant in the Natal Government's Durban Station.

The turbines run at a speed of 1,500 R.P.M., with a working steam pressure of 160 lb. per sq. in. at the stop valve, and from 80° to 100° F. of superheat.

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The governors are of the "Proell" type, and control the turbines within about 1 per cent. from no load to full load; an emergency stop valve of special design is fitted, and comes into operation when the speed of the turbine reaches 1,630 R.P.M.

The generators are of the three-phase type, giving a voltage of 6,600 at a frequency of 50 cycles per second. The tests of these sets gave a temperature rise of 50° F. after six hours' run on full load, with a steam consumption of 19·8 lb. per KW. per hour and with 27 in. vacuum.

Each turbine is provided with its own surface condenser, the water used in connection therewith being pumped from the Bay, some half-a-mile distant.

The air pumps are of the "Edwards" type, and are each coupled to a 10-H.P. E.C.C. motor.

The pumping station, situated on the Bayside, contains two Mather and Platt centrifugal circulating pumps, of 2,335 gallons capacity per minute each, coupled to M. & P. 96-H.P. four-pole D.C. motors running at 900 R.P.M; the starting switches are of the multiple handle type.

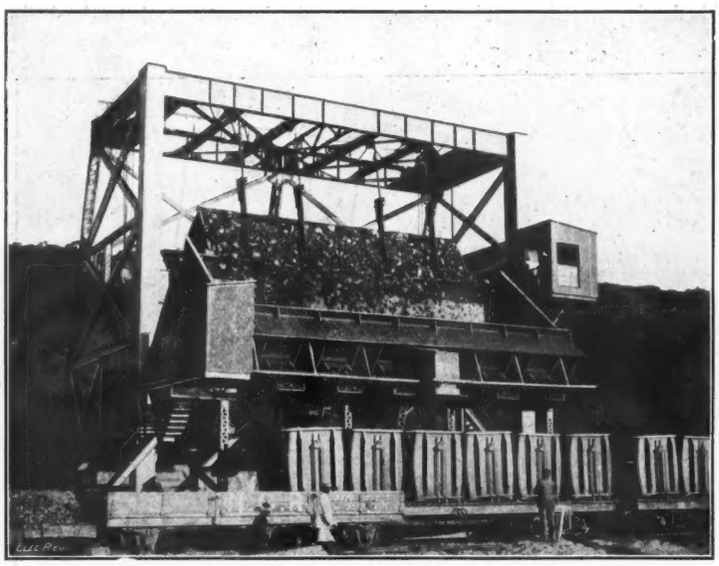
The total head is about 60 ft., including friction in pipes and condensers, and the water is pumped through a 15-in. main to the station.

A 200-KW. Peebles-La Cour motor-converter is installed in the engine room, operating from the existing 210-volt D.C. sets to supply three-phase current at 6,600 volts in parallel with the turbos, or *vice versâ*.

Three 15-KW. oil-cooled transformers, made by Messrs. Hanchett, Barratt & Co. are also installed for supplying three-phase current at 2,200 volts to the Greyville yards, where it is again transformed to 200 and 115 volts for power and lighting respectively.

The original switchboard gallery has been extended round one side of the engine room to accommodate the new H.T. board.

The latter is of the E.C.C. make, with remote controlled mechanically-operated oil-break switches, the H.T. parts being enclosed in fireproof partitions at the back. There are two generator panels, four feeder panels, and one motor converter panel; a mains charging device is fitted under the gallery.

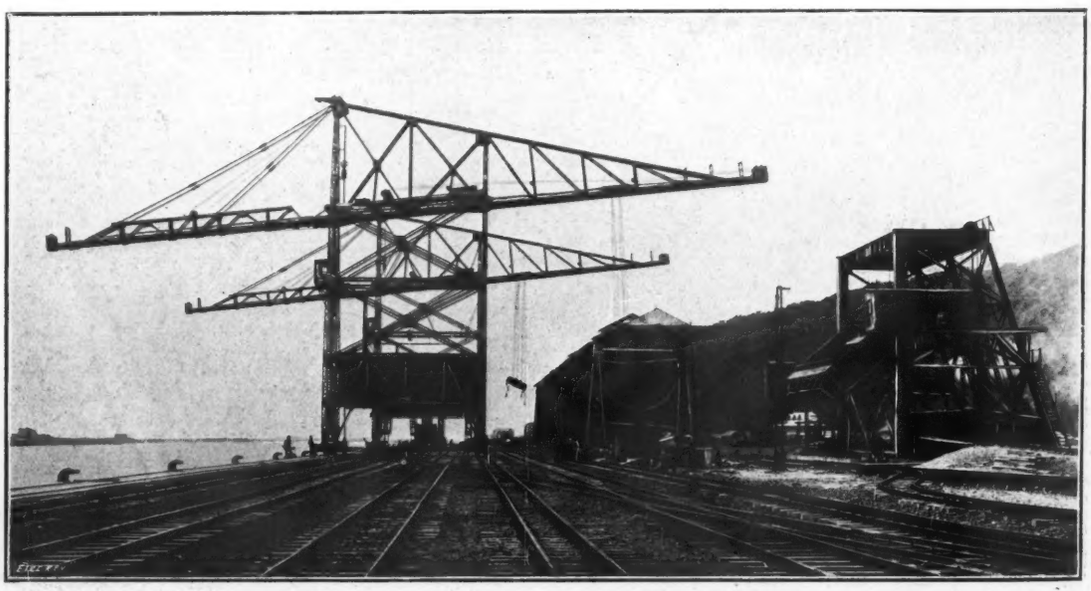


VIEW OF THE ELECTRICALLY-OPERATED COAL DUMPER, DURBAN.

The H.T. compartments are provided with the usual isolating links, oil-break switches fitted with trip coils, and current and potential transformers, &c.

The generator and feeder panels are fitted with time-limit relays, and the motor-generator panel with a relay of the instantaneous type; the feeders are also fitted with ammeters and three-phase integrating wattmeters of Everett-Edgcumbe make, the voltmeters being of the Kelvin multicellular type, with illuminated dials. Everett-Edgcumbe synchronising gear is provided.

The cables for supplying the Point and Bluff sub-stations are laid in duplicate, the work having been carried out under the direction of the B. I. & Helsby Cable Co.; our illustrations (p. 301) show the operation of laying them across the harbour.



TEMPERLEY COALING PLANT, DURBAN, OPERATED FROM THE NATAL GOVERNMENT POWER STATION.

Two three-core ·1-in. feeders are laid direct side by side from the power station to the Point sub-station (a distance of three miles), and are of the paper-insulated type, lead-covered, steel-taped and served; section boxes are arranged at various places for purposes of testing. From the Point to the Bluff sub-station (across the harbour) two three-core ·1-in. cables are laid, also of the paper-insulated class, but

specially designed for submarine work; this, we believe, being the first instance in South Africa of E.H.T. transmission under the sea.

A cable trench was dredged, by means of the Government suction dredgers, to a depth of 47 ft. below low-water level; the normal depth is, however, 30 ft., so that the cables are buried 17 ft. in the sand—a precaution which, it is expected, will prevent a repetition of the experience at Sydney, where the harbour cables were snapped by a ship's anchor.

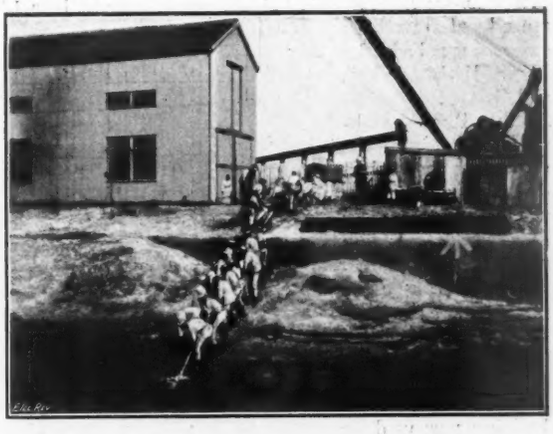
Laying E.H.T. Cable Across the Harbour, Durban.

The radial thickness of the insulation is ·24 in. for each core, and the lead sheath is armoured with a triple layer of galvanised-steel wire laid on a layer of specially prepared jute; the cable is heavily compounded, and served externally with a layer of waterproof preservative compound.

Owing to the presence of the Teredo worm in these waters, it was necessary to protect the cables by means of a continuous brass sheathing which is applied in the form of a brass strip "breaking joint," this sheathing being next in order to the lead.

After laying, the cables were subjected to a pressure of 10,000 volts, A.C., for half-an-hour, since when they have been in continuous use.

The length of cable from the Point to the Bluff sub-station is about 880 yards, 440 of which is laid in the channel.



Connecting the Shore End of the Cable to a Sub-Station, Durban.

In view of the probable developments on the Bluff side, two telephone cables were also laid (28 and 14-pair respectively), these being also specially designed for submarine work. The Bluff sub-station is situated near the line of wharves, and in close proximity to the electrically-operated coal-handling plant. It contains three 300-KW. (6,600-volt three-phase/550-volt D.C.) Peebles-La Cour motor-converters, each having an overload capacity of 25 per cent., and running at 500 R.P.M.

The converters, as will be seen from our view, are of the two-bearing type.

The starting resistances were supplied by Messrs. Bray, Markham & Reiss, Ltd., and are fixed near each machine, the synchronising moment being shown on a voltmeter attached to the resistance.

The parallel running of the converters gives every satisfaction, any fluctuation in the load being very evenly taken up by the machines, which, being fitted with commutating poles, show no tendency to spark, with even very severe fluctuations.

In addition to the converters, there are three 10-KW. oil-cooled single-phase transformers, of Messrs. Hanchett, Barratt and Co.'s make, for supplying the local lighting at 115 volts.

The switchboard is of E.C.C. make, similar in design to that in the power station; there are 6 H.T. cells for the two feeders, three converters and transformers.

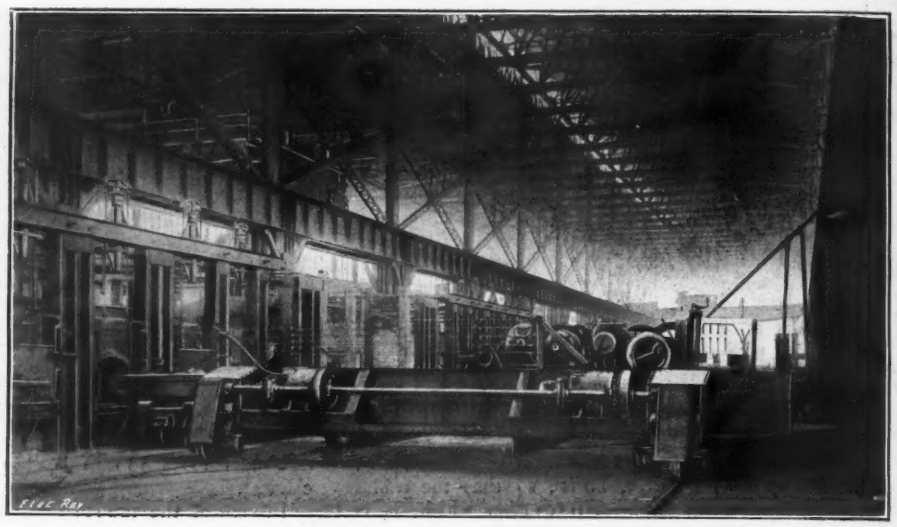
The feeder and transformer panels are fitted with overload time relays, and the converters with instantaneous relays; the instruments are of the Everett-Edgcumbe type.

Wellman 100-ton Electric Ladle Cranes, Union Steel Co.'s Works, Donora, U.S.A. (See p. 303.)

The three D.C. panels for the converters are fitted with instruments of the N.C.S. type. There are two D.C. distributing panels for four circuits, two D.C. arc panels for 10 circuits, and two A.C. panels for local lighting at 115 volts. On the side wall above the switchboard are fixed excess pressure discharges.

The sub-station is well lighted, and is spanned by a 10-ton hand travelling crane, supplied by Messrs. Herbert Morris and Bastert.

The Point sub-station replaced the generating station laid down some 14 years ago by the Harbour Department, the machinery in which, though having done good pioneer service, was not considered as economical as the present arrangement. The portion of the old building now used for the sub-station contains one motor-converter, and H.T. and L.T. switchgear similar to that already described; there are also three 40-KW. 6,400/115-volt and three 25-KW. 6,400/220-volt transformers.



WELLMAN ELECTRICALLY-DRIVEN CHARGING MACHINE (See page 303).

Both D.C. and A.C. current are distributed from here for the incandescent and arc lighting of the wharves and sheds, to private consumers in the Harbour area, the hospital, native and Indian compounds, the gantry crane (ELECTRICAL REVIEW, October 6th, 1905) and the Bay pump house previously referred to.

prepared by Mr. C. J. Crofts, the Natal Harbour engineer; the erection was carried out under the supervision of Mr. G. H. Strayer, of the McMyler Manufacturing Co., of Cleveland (U.S.A.). The plant consists of a McMyler dumping machine, capable of dealing with from 30 to 40 railway trucks of coal per hour, with a maximum load per truck of 70 tons; two Temperley transporters, and a storage bin; the electrical equipment consists of D.C. 500-volt motors, supplied by the G.E. Co. (U.S.A.).

Dealing first with the dumping machine, there is in connection with it a small buffer trolley, termed a "pig," which pushes the loaded railway trucks into position on the "cradle" of the dumper; the "pig" is hauled from a shallow pit up a narrow inclined track in the centre of the railway track, and after having done its duty is allowed to run back by gravity into its pit to await the next truck.

The "pig" hauling drum is coupled to a 110-H.P. compound-wound motor. The truck is raised to the tipping platform of the dumper by means of two 175-H.P.

ELECTRICAL INGOT STRIPPERS AND SOAKING PIT CRANES AT THE UNION STEEL WORKS, DONORA, U.S.A. (See page 303).

Our readers will no doubt be further interested with a description of the recently erected coal-handling plant on the Bluff side, which has created the bulk of the demand for energy from the Bluff sub-station. This is the first plant of its kind in South Africa, and was supplied by the Fulham Steel Works, at a cost of £85,000, to specifications

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compound-wound motors in parallel, which are coupled to a winding drum, provided with double solenoid electric brakes. The truck is tipped sidewise into an "apron" provided with six shoots, which are lowered by means of a 50-H.P. series-wound motor, the coal gravitating into six 6-ton drop-bottom buckets, which are brought into position on a special truck. The latter is then hauled along by winches operated by two 20-H.P. series-wound motors, automatically weighed, and delivered to the transporters for carriage, either to the ship or the storage bin, as the case may be.

The dumper is provided with two controlling cabins, one for the shoot, and one for the tipping and "pig," the controllers for operating the motors being of the Sprague tramway type, with connections arranged to "short circuit" the motor as the empty truck is being lowered, thus making use of its braking power.

The controlling gear for the haulage is fixed on a platform below the transporters, and in full view of the track.

Energy for operating the transporter is collected from an overhead line by means of a trolley fixed to the side, and is led into the controlling cabin in which are fixed the various clutch levers, circuit breakers, &c. The lifting is done by means of a 170-H.P. compound-wound motor, governed by automatic brakes, and the traversing by means of a 50-H.P. series-wound motor, which also elevates the boom and runs the transporter along. The storage bin has a capacity for 10,000 tons, and is 500 ft. in length and divided into 14 compartments, which are rented by the various mines; suspended bins being provided for discharging purposes.

The rate of loading vessels is about 400 tons per hour, either direct or from the bin, and with the increasing popularity of Natal coal, and the splendid facilities of the port, it is hoped that additions will be made in the near future, especially if, as is hoped, the port becomes a naval coaling station.

In conclusion, we are indebted to F. W. Mills, the Government electrical engineer; to Mr. F. Margrie, Messrs. Hubert Davies & Co.'s Durban manager, under whose supervision the contract was carried out, and to Mr. G. H. Strayer, the McMyler Co.'s representative, for assistance in the preparation of this article, as well as for some of our illustrations of the plant.

MODERN AMERICAN STEEL WORKS EQUIPMENT.

The Donora Steel Works and Furnaces, Donora, Pa., form a part of the United States Steel Corporation, and have been in operation for about three years. The equipment of cranes, charging machines, ingot strippers, &c., was designed and built by the Wellman-Seaver-Morgan Co., of Cleveland, Ohio, to fulfil the extremely rigid requirements of modern mill practice.

The pouring side of the open hearth building is covered by three ladle cranes, shown on page 301, having a capacity of 100 gross tons each. They are of 59 ft. 8 in. span, and have a clear lift of 35 ft. Each end of the crane is supported on two four-wheel equalising trucks; and the end girders are carried downward to a distance of about 1½ in. from the main rails, the object of this being to prevent excessive dropping of the crane, if for any reason a truck or one of its wheels should break. All the track wheels on one side of the crane, eight in number, are driven through spur gear by a 50-H.P. motor placed at the end of the bridge farthest from the furnaces.

The operator's cab is placed low down at the motor end of the bridge, within a few feet of the pouring platform; the controllers, which are of the magnetic type so extensively used at present, are carried on a platform at the top of the cab, the master controller only being on the floor with the operator. The main girders of the crane are of the box type with parallel flanges. On the top of these girders the 100-ton trolley travels; and on the inner lower flanges the 25-ton auxiliary trolley travels.

The 100-ton trolley or crab is composed of a heavy steel framework carrying two hoisting drums, driven through a train of spur gearing by a 100-H.P. motor. The armature of this motor is fitted with a powerful brake, operated by a cushion type solenoid, and in addition to this, there is interposed between the hoist motor and drums an automatic mechanical brake similar to the well-known Weston clutch. This, in addition to the magnetic brake, gives the operator full control of the load at all times. The lifting tackle, composed of 24 1-in. diameter ropes of steel, overhangs the main girders and connects by means of sheaves to heavy forged steel equalisers which carry the main lifting beam, also a heavy steel forging. The ropes are protected from the heat by sheet-steel guards. The ladle hooks are made of forged steel, and are of sufficient length to allow the ladle to be turned completely over under the lifting beam. The mechanism for traversing the trolley consists of a 25-H.P. motor, driving two of the four track wheels through a train of spur gearing. The 25-ton auxiliary trolley is of the ordinary single-drum type. The lifting tackle consists of eight parts of ⅞ in. diameter steel rope. The motor for hoisting is rated at 50 H.P., and that for trolleying at 7½ H.P.

The various speeds of the crane are as follows:—100-ton hoist, 10 ft. per min.; 100-ton trolley travel, 50 ft. per min.; 25-ton hoist, 25 ft. per min.; 25-ton trolley travel, 100 ft. per min.; crane bridge travel, 100 ft. per min.

The charging platform on the opposite side of the furnaces is covered by two ladle cranes of 50 tons capacity, of the same design and capacity as the 100-ton cranes above described.

For charging the open hearth furnaces, 12 in number, there are three Wellman low-type open hearth charging machines, as shown on page 302, travelling on a 22 ft. 8 in. gauge track. Their capacity is about 8,000 lb. each, this being the maximum amount of scrap that can be piled into a 7-ft. charging box. Each machine is composed of two distinct carriages; the girders carry on their inner lower flanges a track on which the upper carriage travels. The girders are further strengthened by a horizontal member rivetted to the bottom flange and extended outward about 3 ft., on which the two 25-H.P. bridge motors are located. This double bridge drive is a great safeguard against loss of time due to breakdowns, as the bridge motors undoubtedly have the most severe service, the machines being almost invariably used as locomotives for shunting the loaded charging cars. The upper carriage is pivotted on the forward axle. The ram, extending forward, is given a vertical rocking motion by means of cranks, operated by a 25-H.P. motor through a train of spur gearing. The cross travel of the trolley is secured by a 25-H.P. motor driving the two front track wheels through a train of gearing. The ram at the forward end is locked into the socket in the charging box head, and the rear half is arranged to revolve in bearings, enabling the operator to turn the box over the furnace, discharging its contents. This motion is obtained by a 7½-H.P. motor connected to the rear end of the ram through a train of gearing. All the motions are controlled from a platform at the rear of the upper carriage. The lift of the box on the end of the ram is 27 in., the stroke of the ram, 17 ft. The various speeds of the machine are as follows:—Hoist, 20 strokes per min.; trolley travel, 150 to 200 ft. per min.; bridge, 250 to 300 ft. per min.; twist, 20 R.P.M.

From the open hearth building the cars carrying the ingots in the moulds are shunted to the soaking pits, as shown on page 302, and stripped by two 70-ft. span electric overhead travelling ingot strippers, seen in the foreground, each having a capacity for lifting a mould and ingot weighing 10 tons and exerting a pressure of 100 tons on the end of the ingot. In case of stickers the machine will exert a pressure of 175 to 200 tons for a short time without injury to the mechanism.

The machines each consist of a trolley or carriage of special design travelling on a crane bridge of extra heavy construction. A single 50-H.P. motor drives two of the main track wheels, one at either end of the bridge. The cab, located at one end and to one side of the bridge, contains the controllers, switchboard and other operating levers. There are five distinct motions in the trolley. The

stripping mechanism consists of a vertical telescopic tubular construction, the two sections each carrying a heavy bronze nut working on a forged steel screw with right and left-hand threads. This is driven by 100-H.P. motor through a square shaft on which the driving pinion slides vertically. The upper section of the telescope carries the stirrups or tongs which engage the lugs on the ingot moulds. The lower section carries the ram or plunger which bears on the end of the ingot. This mechanism is carried by a cross-head suspended from the trolley by four 1-in. steel ropes. When the tongs engage the lugs on the mould, the rotating motion of the right and left-hand screw tends to separate the telescopic parts, the lower one remaining stationary, and the upper one rising vertically and carrying the empty ingot mould with it. The hoisting mechanism consists of a single drum driven by a 100-H.P. motor through a train of spur gearing, in which is inserted the usual automatic mechanical brakes and safety devices. The cross travel is similar to that of the ladle cranes, and is operated by a 25-H.P. motor. The opening and closing of the tongs is under the complete control of the operator at all times, the tongs being connected through a crank motion and lever to a 7½-H.P. motor carried on the upper part of the trolley. An auxiliary hoist of five tons capacity also forms a part of the trolley, being used for handling moulds and for general service; this is driven by a 25-H.P. motor.

This type of stripper has by long use been demonstrated to be the best design for the heavy service to which it is subjected. The speeds of the stripper are as follows:—Main hoist, 50 ft. per min.; auxiliary hoist, 50 ft. per min.; stripping screw, 10 ft. per min.; cross travel, 125 to 150 ft. per min.; longitudinal travel, 250 to 300 ft. per min.

The effective stripping stroke of the screw is 3 ft. and the lift independent of the stroke of the screw is 7 ft.

Directly beyond the space occupied by the strippers are two vertical ingot cranes covering soaking pits. These cranes travel on the same track as the strippers and charge the stipped ingots from the cars to the pits and from the pits deliver them on to the rolls. The bridges of these cranes are duplicates of those for the strippers; the trolley, however, is necessarily of different design. The tongs are carried at the lower end of a telescopic tube to which the hoist ropes are fastened.

The hoist gearing is similar to that of the stripper and ladle cranes, a 50-H.P. motor being used for driving.

For the gripping motion of the tongs, and the rotating motion of the same, 5-H.P. motors are used. The cross travel and auxiliary hoist are the same as on the strippers, the same size motors being used. The telescopic tubes are guided in a structural steel frame-work depending from the main trolley.

The speeds of the machine are as follows:—Main hoist, 60 ft. per min.; auxiliary hoist, 50 ft. per min.; cross travel, 200 ft. per min.; rotation of tongs, 20 R.P.M.; longitudinal travel, 300 to 350 ft. per min.

In conclusion, we are indebted to the Wellman-Seaver-Morgan Co. for the particulars here given.

Glow-Lamp Resistances.—In the *Electrical World* for August 1st, Mr. A. C. Stevens discusses the use of glow lamps as non-inductive constant resistances. The high negative temperature-resistance coefficient of ordinary carbon lamps has hitherto rendered it impossible to obtain constancy, but by combining in parallel with these a suitable proportion of graphitised-filament lamps, which have a high positive coefficient, it is possible to secure constancy over a considerable range of voltage. The author, by experimenting with various lamps, found that more than one carbon lamp must be employed to compensate one graphite lamp, and gives a method of calculation by means of which the correct proportions can be predetermined for given ranges of voltage. Thus for a range of 35-115 volts, two carbon and one graphite 110-volt lamps give a resistance varying less than 1 per cent. from the mean. From the curves accompanying the article, it appears that between 50 and 120 volts, combinations of 3 : 1, 4 : 1, and 5 : 1 give resistances of remarkable constancy—for instance, with five carbon lamps to one graphite lamp, the resistance between 60 and 120 volts varies only about 0·3 per cent. Similar results were obtained with tantalum instead of graphitised-filament lamps. Lamps can also, of course, be coupled in series to give high resistances of fair constancy; thus one carbon and one graphite lamp in series gave a variation from the mean of about 1 per cent.

CONTRACTORS' COLUMN.

(*Continued from page* 298.)

HARROGATE.—Houses, Duchy Road, D. Simpson, builder; Birch Grove, for D. Sayner; Tewit Well Road, for G. Brown; Bilton Grove Avenue and Church Avenue, C. A. Nettleton, builder, Balmoral House; Tewit Well Avenue, for J. H. Owston; Poplar Grove, for Brown & Stables. Motor garage, Mornington Terrace; J. Allen & Son, builders, Mornington Terrace.

HARTLEPOOL.—Additions to Moor House, Friar Terrace, for Dr. W. S. Gibb.

HASTINGS.—Parish room in Hughenden Road, Hastings, for Canon Hodges, Christ Church, Blacklands, Hastings; A. W. Jeffery & Son, architects, Havelock Road, Hastings. Stationmaster's residence at West Hill Road, St. Leonards; C. Mercer, architect to the South-Eastern Railway Co. Two residences in Old Church Road, Hollington, St. Leonards, for W. Smith; A. Day, architect, Town Hall Chambers, Hastings. Additions to private residence, 19, Church Road, St. Leonards, for J. H. Weatherseed; Coussins & Rothwell, architects, Havelock Road, Hastings.

HEMEL HEMPSTEAD.—Houses, Ebberns Road, for F. W. Riddle; Belswains Lane, for T. C. Gold.

HESSLE (near Hull).—Semi-detached villas, South Field Estate, for P. T. Runton. Runton and Barry, architects, Victoria Chambers, Bowlalley Lane, Hull.

HEYWOOD.—Important additions to mill premises. Messrs. Hargreaves.

HIGHAM FERRERS.—Workshops, High Street, for F. Randall.

HIGH WYCOMBE.—Additions to Bourne Villa, Oxford Road. Hooper and Nash, architects, Church Square, High Wycombe.

HINCKLEY.—Houses, Factory Road, for F. Bloxham; Clarendon Road, for A. Toone; Highfield Road, for Jas. Baker; Priesthills Road, for Mrs. E. Rogers.

HINDLEY (near Wigan).—Five houses, Hall Lane, for W. Stott & Sons; vicarage, for the Church of St. John the Evangelist, Hindley Green.

HORSHAM.—Assembly Hall for Horsham Grammar School (£2,750). Wheeler and Godman, architects, Bank Chambers, Carfox, Horsham.

HOUGHTON-LE-SPRING (Co. Durham).—Houses, Wheler Street, for Matthew Brown; house and shop, Newcastle Street, for W. A. and J. E. Johnston.

HUDDERSFIELD.—Houses, Branch Street, Paddock, and Bradshaw Road, Honley, and warehouse at Longroyd Mills; J. Berry, architect, 3, Market Place, Huddersfield. New public elementary school on the Birkley Hospital site; Borough Engineer. Detached house at Salendine Nook; N. Culley, architect, 13, John William Street, Huddersfield.

HYDE.—Houses, Oldham Street, for J. Chatterton & Son; Grosvenor Road, for Wm. Horgrove & Sons.

HETTON-LE-HOLE (Co. Durham).—Houses, Elemore Lane, for R. P. Stewart.

ILFORD.—New Unitarian Church, High Road; Richards, Richardson & Gill, architects. Alterations and additions to Beehive Lane Schools, for the U.D.C.; C. J. Dawson, architect, 11, Cranbrook Road, Ilford.

INCE.—Houses, Platt Bridge, for Thomas Bennett; Bird Street, for Henry Dickinson.

IRLAM (Lancs.).—Houses, Caroline Street, for D. Walton; Atherton Lane, Cadishead, for W. Garner.

KEARSLEY (near Bolton).—Additions to dyeing departments at Bent Mill.

KEIGHLEY.—Probable re-erection of premises after fire, for Verity and Shuttleworth, picture moulding manufacturers.

KENDAL.—New business premises, motor garage and workshops, for J. Alexander & Sons, and rebuilding other premises; J. Hutton, architect, Kendal. New parish church at Natlands; the Vicar.

KETTERING.—Shops and offices, Market Place, for Berry Bros. & Bagshaw (£925); J. G. Covington, builder, Kettering. Houses, Kingsley Avenue, for the Co-operative Society; shops and club premises, Dalkeith Place, for S. Manby; villa residence, Rockingham Road, for T. Seddon.

KILMALLOCK (Bruff).—Curate's residence at Knockaney, Bruff. J. Guerin, architect, Knockaney.

KINGSBRIDGE (Devon).—Development of Bigbury Estate, on lines of a watering place.

KIRKBURTON (near Huddersfield).—Six cottages and other works at Storthes Hall Asylum (asylum has own generating plant). J. Vickers-Edwards, county architect, County Hall, Wakefield.

KIRKDALE.—New premises for the Liverpool Co-operative Society.

LICHFIELD.—Houses, Gaia Lane, for J. Thorneloe & Sons; St. Chad's Road, for J. R. Deacon.

LISRANE.—Additions to Pentwyn. G. W. Cooke, Pentwyn, Lisrane.

LITTLEHAMPTON.—New Church, St. James's (£3,000). Wheeler and Godman, architects, 6, Staple Inn, London.

LIVERPOOL.—Restoration and enlargement of North Meols Parish Church (£3,300); Rev. R. D. Blakeney, Vicar. Conversion of the Parthenon into clothing emporium.

LIVERSEDGE (Yorks.).—Houses, Benjamin Street, for D. T. Beaumont.

LLANDAFF.—Twelve houses, Mill Road, Ely, Llandaff; A. Palmer, builder, Llandaff. Two houses, Canada Road, Gabalfa; G. Leonard, builder, Gabalfa, Cardiff.

LLANDRINDOD WELLS.—Two houses and shop, Iremont Road, for G. Millward and Walter Price; alterations and additions to the Bridge Hotel, for Mrs. Miles; additions to the Catholic Presbytery; motor depôt, for T. Norton & Co., Ltd.

LLANDUDNO.—Free Library for the U.D.C. G. A. Humphreys, architect, Mostyn Street, Llandudno.

LLANDYSSUL (Cardigan).—Enlargement of County School (£465). W. D Lewis, architect, North Parade, Aberystwyth.

LLANISHEN (Cardiff).—House in Brill Road, for Mrs. M. A. Cadwallader.

LOCHGELLY.—Manse for the Glencraig and Lochore U.F. Church.

LONDON.—(Duke Street, W.).—Extension to No. 49 for W. Smith, hosier and glover, 396, Oxford Street, W.

(W.).—Business premises and flats in Henrietta Street and Wimpole Street. Wm. King & Son, builders, 3, Vauxhall Bridge Road, S.W.

(W.).—Addition, Whitefield's Tabernacle, in Tottenham Court Road. W. Downs, builder, Hampton Street, Walworth, S.E.

(Friern Barnet, N.).—Development of Bethuen Estate. Bennett and Strutton, architects, Broadway, Finchley.

(W.).—Rebuilding Nos. 13 and 14, Great Castle Street. H. Kingerlee and Sons, builders, Oxford.

(Deptford, S.E.).—New shops, &c., on site of brewery, corner of Brookmill Road and Deptford Broadway.

LONDON (Barnes, S.W.).—50 houses, Graemesdyke Avenue, to be wired for the E.L.; G. Smith & Sons, builders. Houses, Ellison Road, for G. Smith. Alterations, Working Men's Institute; Bartlett and Ross, architects, 8, Bream's Buildings. W.C. Twenty-one villas. Manor Grove, Fitzgerald Estate; R. B. Rowell, architect, Triangle Corner, East Sheen, S.W.

(Lewisham, S.E.).—Ten houses; W. A. Scudamore & Sons, builders, 13, Manor Lane, S.E. Four houses; James Watt, builder, Bromley Road, Catford, S.E. Thirteen houses; H. and G. Taylor, builders, Boyne Road, Lewisham. Shop, Perry Hill; J. W. Falkner & Sons, builders, 24, Ossory Road, Old Kent Road, S.E.

(Dulwich, S.E.).—Benedictine monastery and church. J. N. Cowper, architect, 35, Old Queen Street, S.W.

(Leyton, N.E.).—Additions to factory; A. W. Hudson, architect, 87, Finsbury Pavement, E.C. Alterations to "The Alma" beer house; W. G. Ingram, architect, 4, Verulam Buildings, Gray's Inn Road, W.C. Additions to offices; W. Manders, builder, Leyton Green, Leyton. Shop, house, and stores in High Road for Stratford Co-operative Society, 54, Maryland Road, E. Proposed extended installation of E.L. for F. Bearman, draper, &c., Leytonstone. Additional office accommodation for Council (£8,600), E.L. to be installed; W. Dawson, surveyor to Council, Town Hall, Leyton.

(Seven Sisters Road, N.).—Buildings for London and South-Western Bank. Muskett & Co., surveyors, 491, High Road, Tottenham, N.

(East Ham, E.).—Workshops and gymnasium at the Technical College. A. H. Campbell, Town Hall, East Ham, E.

(Regent's Park, N.W.).—Shops and offices, 58-62, Park Road. Patman & Co., builders, Enfield.

(Walworth, S.E.).—Two shops and houses, 381-3, Walworth Road. E. Marrable, contractor, Leytonstone, N.E.

(W.).—Private house in Margaret Street. Godson & Sons, builders, Pembroke Works, Kilburn Lane, N.W.

(Tottenham, N.).—Additions to workshops for Atlas Metal and Alloys Co., Ltd., 52, Queen Victoria Street, E.C. Nineteen houses; G. W. Rowley, builder, 278, Philip Lane, N. Dancing hall at rear of 14, Bruce Grove for Union Club, Ltd. Forty-nine houses; T. Rowley, c/o Hodson and Whitehead, architects, 7, Finsbury Square, E.C. Piano-frame factory in Fountayne Road, for Clark & Co., Broad Lane Ironworks, Tottenham. Additions to 357 and 359, West Green Road; Hillyer and Hillyer, estate managers, West Green, Tottenham, N.

(Mortlake, S.W.).—Three houses, Glendower Gardens. C. Ellis and Co., builders, East Sheen, S.W. Four semi-detached villas; R. B. Rowell, architect, Triangle Corner, East Sheen, S.W.

(W.).—Shops and offices in Barrett Street. Galbraith Bros., builders, Camberwell Green Works, S.E.

(W.).—Shops and offices in Coventry Street. Holliday & Greenwood, Ltd., builders, Loughborough Park Works, Brixton, S.W.

(S.E.).—Further extension of premises for the General Motor Cab Co., Ltd., Brixton Road and Camberwell New Road. Allen and Co., builders, Pimlico Wharf, Westminster, S.W.

(New [Cross, S.E.).—Building in Briant Street, for the National Telephone Co. C. P. Roberts & Co., builders, St. Paul's Road, Highbury, N.

(W.).—Flats in Bolsover Street. Holloway Bros., contractors, Victoria Wharf, Belvedere Road, S.E.

(W.).—Royal National Orthopædic Hospital (rebuilding). Holloway Bros., contractors, Victoria Wharf, Belvedere Road, S.E.

(Aldgate, E.).—Shops and offices in Mitre and Duke Streets. W. Lawrence & Son, contractors, Waltham Cross.

(E.C.).—Offices in Little Britain. Patman & Fotheringham, contractors, 100, Theobald's Road, W.C.

(W.C.).—Flats in Southampton Row. Messrs. Johnson, builders.

LOUGHDUFF (Co. Cavan).—Church, for the Rev. T. O'Reilly. T. F. McNamara, architect, 50, Dawson Street, Dublin.

MANCHESTER.—New Institute in Cavendish Street. J. Chapman & Sons, builders, Patricroft.

MANSFIELD.—Additions to Rosemary Schools for the T.C. Vallance and Westwick, architects, White Hart Chambers, Mansfield.

MARGATE.—Bungalows, Grosvenor Place; E. Padget & Sons, builders, 1, Eaton Road, Margate. Extensive alterations to business premises, Queen Street (electric light probably to be installed); Reeve & Reeve, architects, Margate.

MARKET RASEN.—House and shop, corner of Jameson Bridge Street and Queen Street, for T. Hill.

MARPLE (near Stockport).—Houses, Carr Brow, High Lane, for W. McKie, Disley.

MELLOR (near Stockport).—Houses, Longhurst Lane, for James Pott, Marple.

MELTON MOWBRAY.—Secondary School in Burton Road, for the Urban District Council. Houses, Old London Road and Victoria Street West, for R. W. Knowles; villa, Craven Street West, for Mr. Clarke.

MIDDLESBROUGH.—Extension of the Workhouse Master's residence (£341). Board of Guardians.

MILNSBRIDGE.—House and shop, Manchester Road. S. M. Balmford, architect, Longwood.

MIRFIELD (Yorks.).—Houses, Greenside, for J. H. Sheard.

MONZIE (Crieff).—Alterations to school (£360). Clerk, Monzie School Board, Crieff.

NAIRN.—New school in Millbank Street, for the School Board (£6,300).

NEATH.—Two houses, Glyn Neath Road, Resolven, for Lewis Lewis, Brondeg House, Resolven; J. Cook Rees, architect, Neath. Additions and alterations to Skewen Council School; T. Mansel Franklen, Clerk to County Council, Cardiff. Rebuilding the Cross Inn, Pontardawe, and rebuilding the Dillwyn Arms, Pontardawe; J. Cook Rees, architect, Parade Chambers, Neath.

NELSON (Lancs.).—Extensions and alterations for Edward Street Room and Power Co.; also for Pendle Street Room and Power Co.

NESTON (Cheshire).—Dynamo shed for the Hinderton Hall Estate; houses, Hanns Hall, for A. H. Read; Parkgate Road, for Evans and Wright.

NEWPORT (Mon.).—New Y.M.C.A. premises; G. W. Rankin, Buildings Secretary, Y.M.C.A., Newport. Additions and alterations to Malpas Schools; E. M. Linton, architect, Westgate Chambers, Newport, Mon.

NEW TREDEGAR (Mon.).—Thirty-five houses for the the Birchgrove Building Club. D. W. Price, architect, New Tredegar.

NORMANTON.—Nine houses for Tetley & Son.

NORTHWICH.—New Church Hall for the Vicar of Marston. Bowling Green pavilions and shelter; District Council Parks Sub-Committee.

NORWICH.—Restoration of Flordon Church.

NOTTINGHAM.—Proposed new maternity hospitals. Collin's Hospital Charity.

OAKHAM.—Thirty-three houses, King's Road Estate; W. Higgs, builder, High Street.

ORPINGTON.—New church, St. Joseph's and St. Anne's Homes (£3,000). G. Godson & Sons, builders, Pembroke Works, Kilburn Lane, London, N.W.

OSWESTRY.—Houses, Edward Street, for J. C. Vaughan; stables, Middleton Road, for Humphrey Jones.

PENDLETON (Manchester).—New Baptist Church in Nursery Street (£2,000).

PENRHIWCEIBER.—Villa for I. Davies. J. Ll. Smith, architect, Aberdare.

PERTH.—Proposed new infirmary; J. J. Burnett, architect, 289, St. Vincent's Street, Glasgow. Two tenements of dwelling-houses, at Shore Road; T. Leith, builder, Perth. New City Hall (£12,000); Stephenson & Scott, measurers, Perth.

PETERHEAD.—New school laboratory at Crimond.

PLYMOUTH.—Conversion of North Road Schools into secondary school for the T.C.; Hine, Odgers & May, architects. Shop and premises, West Street, Millbrook, for West Bros.; Carder & Carder, architects, 24, Lockyer Street, Plymouth.

PONTYPOOL.—Extension of the Pontypool and District Hospital. J. C. Hanbury, President of the Executive Board.

PORTSMOUTH.—Enlargement of Eastney Police Station (£300).

PORT TALBOT.—New premises for the Taibach and Port Talbot Co-operative Society. W. Davies, secretary.

PRESTON (Farington).—Extensions at St. Paul's Church. J. A. Seward, architect, Preston.

RADNORSHIRE.—Nine houses at the Asylum for the C.C. (£3,066). J. C. Evans, builder, Talgarth, Breconshire.

RAMSGATE.—Proposed enlargement and improvement of St. Lawrence Parish Hall. Rev. R. F. Bevan, Vicar.

REIGATE.—E.L. to be installed at premises in Mill Street for G. Waters, and at "Santo," Flanchfords, for Mr. Whittington.

ROCHESTER.—Improvements at Halling Council School. W. H. Robinson, architect to the Kent Education Committee, Caxton House, Westminster, S.W.

ROMSEY (Hants.).—New wards, nurses' room, &c., at the Nursing Home and Cottage Hospital. J. Jenvey, architect, Market Place, Romsey.

RUGELEY.—New Catholic Day Schools (£1,800). H. T. Sandy, architect, 22, Greengate, Stafford; Chas. Mason, builder, Rugeley.

SADDLEWORTH (Yorks.).—Villas. Mr. Wheelwright, Saddleworth.

ST. ANDREWS.—Lock-up shop at The Square, Dinas Powis. D. T. Alexander, auctioneer, Cardiff.

ST. AUSTELL.—Two houses for R. Bray, Carloggas, St. Austell.

ST. HELENS.—Shop, warehouse and showroom, Naylor Street, for R. Robinson; additions to house, King's Road, for F. W. Tinker; conversion of house and shop into two houses, Eltonhead Road, for R. Davies. St. Thomas's Church to be rebuilt (£7,000); F. S. Biram, architect, St. Helens.

ST. STEPHEN'S-IN-BRANELL (Cornwall).—Church room and offices, Nanpean Street, for J. B. Fortesque; A. E. Skentelbery, architect, Boconnoc Estate Office, Lostwithiel. Three houses for R. Goldsworthy, Treviscoe St. Stephen's.

SALFORD.—New pump houses at electricity works. Salford Corporation.

SALISBURY.—New stables for the T.C. W. J. Goodwin, City Engineer and Surveyor, Municipal Offices, Salisbury.

SANDBACH (Cheshire).—Waterworks developments, for the District Council.

SEVENOAKS.—New premises for the Capital and Counties Bank, Ltd., London. W. H. M. South, builder, Western Avenue, Ashford, Kent.

SCORRIER (Cornwall).—Rebuilding mansion (destroyed by fire), for J. Williams. B. C. Andrew, architect, St. Austell.

SHEFFIELD.—Proposed municipal lodging house. New Primitive Methodist Sunday Schools, Greystones Road; H. Harper, architect, 54, Long Row, Nottingham. Additions and alterations to Ranmoor Street Schools, for the Education Committee; A. F. Watson, architect, 38, Church Street, Sheffield. New church at Harpur Hill, Burbage. New school building scheme, in connection with the Sheffield Bluecoat School.

(Tinsley).—Alterations and additions to the Tinsley and District Working Men's Club and Institute. D. B. Jenkinson, architect, Imperial Buildings, Rotherham.

SHEFFORD (Beds.).—Improvements at the Parish Church (£700). Rev. W. K. Stuart, vicar.

SHILDON (Co. Durham).—Houses, Redworth Road, for J. Moore; Waterloo Street, for Mrs. M. Watson; extensions to offices, Shildon Lodge Colliery, for Bolckow, Vaughan & Co., Ltd.

SHIPLEY.—Extension of Sir Titus Salt's Hospital, Saltaire. W. Wilcock and Son, architects, 9, Leeds Road, Bradford.

SLAITHWAITE (Yorks.).—Four houses, Hill Top. Arthur Shaw, architect, Golcar.

SPENNYMOOR (Co. Durham).—Houses, Dean Road, for T. Parker; Ruby Terrace, for W. Gill, jun.; Tudhoe Colliery, for A. Hodgson; Ruby Terrace, for H. Goundry; Durham Road, for A. Greenwell.

STOCKPORT.—Probable developments for Dickie, Glass & Co., towel manufacturers, of Farnworth, Bolton.

STROUD (Glos.).—Houses, Pakenhill, for G. E. Harper, builder, Paganhill.

STONEHOUSE (Devon).—Extension of the Nurses' Home, 84, Durnford Street.

STRATHPEFFER (Ross-shire).—New United Free Church and manse.

SUNDERLAND.—Shops, &c., 168, Roker Avenue, for L. B. Smith; Vaux and Mark, architects, 66, John Street. Extensions to works, Hendon Road, for Dawson & Asher; W. and T. R. Milburn, architects, 20, Fawcett Street, Sunderland. Library, Kayll Road; Hugh Hedley, architect, West Lawn. Houses, Inverness Street, for Andrew Ridley; J. Potts & Son, architects, 57, John Street. Houses, Eden House Road; G. T. Brown, architect, 51, Fawcett Street. Sunday Schools at South Hylton; T. E. Davidson and Son, architects, Newcastle-on-Tyne; M. R. Draper & Sons, builders. Alterations to King's Theatre, Crowtree Road and South Street.

SUTTON-IN-ASHFIELD.—Houses, Dalestorth Street, for W. Hodgkinson; Dalestorth Street, for James Lee.

SWADLINCOTE.—Power house, for Hall's Collieries, Ltd.; houses, Church Street, for J. R. Winson; Church Street, for S. Cooper; Burton Road, Woodville, for P. H. Mellor; Beard's Road, Newhall, for Joseph Parker; Wood Lane, Newhall, for James Lane.

SWINTON (Lancs.).—Houses, St. Peter's Road, for Joseph Chester; Folly Lane, for Wm. Hope.

TADCASTER.—New Sunday school for girls.

TEBAY (Westmoreland).—New schools for the C.C. Sproat, Farmer and Warwick, architects, Liverpool.

TIPTON.—Renovation of schools, for the U.D.C. E. Richards, secretary, Education Committee.

TONYPANDY.—Business premises in Bridge Street. R. S. Griffiths, architect, Tonypandy.

TREDEGAR (Mon.).—Bungalow, Ashfield Road, for E. Allen; six houses, Market Street, for John Power.

TRURO.—New Cathedral Grammar School (£3,000 to £4,000) for the Dean and Chapter.

TUNBRIDGE WELLS.—Houses, Eridge Road, for Marquis of Abergavenny; Culverden Avenue, for R. J. Fenton; Culverden Avenue, for F. Avon; alterations and additions to premises, 11, London Road, for Clarke & Rawson; studio, 9, Lime Hill Road, for Mr. Bucknall; houses, Western Road, for A. H. Threadgold.

TURTON (Lancs.).—Valve and chalk houses for Bolton Corporation.

WALTON-ON-THE-NAZE.—Convalescent Home for the Jewish Board of Guardians, London (£23,000). Lawrence & Co., builders, Westminster, London.
WELLS (Norfolk).—Church room. Rev. G. H. N. Ingle, rector.
WEMBLEY.—Four houses. W. Poulter, builder, 59, St. John's Road, Wembley.
WENROE.—New farm on Wenroe Castle estate.
WEST BRIDGFORD (Notts.).—Suggested public hall in Musters Road.
WEST HARTLEPOOL.—Houses, Jackson Street, for J. W. Robinson; Bright Street, for G. Booth; alterations and additions to house, Front Street, Seaton Carew, for J. C. P. Thompson. Rocket house for the Board of Trade.
WESTHOUGHTON.—Probable developments for the Westhoughton Coal and Cannel Co.
WHITEHAVEN.—Extension of offices and sawmills for J. & W. Jackson. J. S. Stout, architect, 36, Lowther Street, Whitehaven.
WHITLAND (Carmarthenshire).—Dwelling house, &c., for W. Wainwright. J. Preece James, architect, Tenby.
WHITSTABLE.—Houses, Church Street Road, for W. S. Taylor; Clare Road, for Mr. Grant.
WIGAN.—Two houses, with shops and stables, Chapel Lane and Wood Street, for Miss E. Wood.
WIGTON.—Alterations to Upton school, Caldbeck.
WINCHESTER.—Additional office accommodation for the Hants County Council.
(Wonston).—Restoration, after fire, of Holy Trinity Church.
WINSFORD (Cheshire).—Houses, St. George's Road, for J. Noden.
WOOLACOMBE (Devon).—New church (£5,000). Rev. A. Creon, curate-in-charge.
WOMBWELL (near Barnsley).—Seventeen houses, Main Street. F. B. Ward and Son.
WORKSOP.—Linotype house, Potter Street, for F. Sissons, printer; alterations to premises, Westgate, for Hunter & Hall; six houses and shop, Overend Road, for A. Chadwick; villas, Watson Road, for G. E. Beech; six houses, Stubbing Lane, for Foster & Mokes; alterations to premises, Sandhill Street, for Geo. Smith.
WORSLEY (Lancs.).—Two pairs of villas, Hardy Street, for F. Tyldesley.
WORTHING.—Convalescent home in connection with the Royal Surrey County Hospital (£2,500). E. L. Lunn, architect, Guildford.
WRITTLE (Essex).—New village hall (£683). R. Mawhood, architect, Chelmsford; F. Moss & Son, builders.
YARMOUTH.—Offices and store for the Yarmouth Steam Drifters Co.
YORK.—Extensive additions to York Station, including electric signalling system, for the North-Eastern Railway Co. (£50,000).

NOTES.

The City of Light.—Under this heading Mr. R. Brownrobert writes as follows:—

"If thou would'st view aright the City White,
Go visit it by the electric light."

Looking around me at the Exhibition the other night I marvelled to see the wonderful effect produced by the electric light, the night being turned into day, and the people and their adornments, the buildings, flowers and other objects showing up as plainly as they can be seen in the daytime. How wonderful, I said to myself, and I thought of Faraday and the others; and then I thought of the miserable encouragement that is being given to electrical engineers by their fellow-countrymen, and by municipal bodies in particular; the starving salaries; the insulting advertisements, qualified men being advertised for at times for pay as low as 30s. per week of 56 hours, which means Sunday labour throughout the year; and the abominable difficulty and expense that parents are put to in obtaining a good engineering training for any of their sons who may want to become electrical engineers and nothing else—at least, nothing else until they find out to their great sorrow years after what a big mistake they have made.

It took only a moment to switch on that wonderful flood of light all over that large area, showing up the beautiful buildings and exhibits and everything to perfection. I then asked myself the question, would it not take hundreds of hands, with ladders, &c., whole day to light up half the number of gas lamps? And, putting another poser to myself, I said, who can therefore say that the great show could have been made a success without the electric light? What a satisfaction I thought it would be if every householder and business proprietor could have the benefit, at a reasonably low price, of so beautiful a light, so clean, so safe, so healthy, and so superior in every way to gas.

The gas companies, with their enormous interests at stake, block the way, of course, and I fear that the couple of hundred millions or so that would be required to buy out the gas companies, could not be raised by the electric lighting companies and public bodies.

But, in the long run, electric lighting must replace gas all over the country, and I have the idea that electricity could be supplied at a cheaper price than gas if the suppliers could raise sufficient capital to wire and place hangings in small houses, free of charge, and in larger houses and business premises at cost price to landlords or tenants against repayment in small amounts added to the quarterly lighting bill. In this way only, in my opinion, will the electric lighting companies succeed in making their businesses pay, and in ousting gas altogether from our dwellings and business places.

The transformation from gas to electric lighting all over the country, if it could be commenced soon, would give work for years to come to the unemployed, would also circulate capital, and would stave off the hard times which at present threaten our engineering trades.

P.S.—I beg to be excused for mutilating Scott's beautiful lines:—

"If thou would'st view fair Melrose aright,
Go visit it by the pale moonlight."

Appointment Vacant.—Sub-Inspector of Scientific Supplies for the India Store Department, London. See our advertisement pages for particulars.

Experimental Variable-ratio Transformer.—A convenient method of obtaining a wide range of A.C. voltages at small cost is described in the *Electrical World* for August 1st, by Mr. G. T. Hanchett. An old Gramme ring armature is used for this purpose. The connection to every alternate commutator bar is cut, the armature wires being short connected, and the armature circuit is opened at one point, the ends being brought out to terminals. A point in the winding at some distance from either of the terminals is then connected to a third terminal, and a brush which can be moved round the commutator to a fourth. The source of power is connected to the third terminal and to the nearer of the two first mentioned, spanning, say, a third of the winding (the best position depends upon the construction of the armature, and the span must not be too small, lest the winding should be overheated). The secondary voltage between the remaining terminals can then be varied from 0 to the maximum, by moving the brush round the commutator. The device is very convenient in repair shops, where only one supply voltage is available for testing motors, &c., and will stand a great deal of rough usage.

Voltage Regulation.—Writing in the *Electrical World*, Mr. A. T. Kasley describes a method of assisting the regulation of compound-wound direct-current generators. When a motor or an elevator is thrown on the circuit the voltage drops for two reasons. The first one is that the field strength cannot be instantly increased to make up for the armature resistance and armature reaction losses. The currents in the series coils, of course, must vary as the load changes, but an increase in the number of magnetic lines cannot take place without their cutting the coils of the shunt field and producing in them a back E.M.F., which, on account of the great number of turns, is very high—so high that the shunt field will be momentarily decreased almost as many ampere-turns as the series field increases. Some machines have their coils wound on metal spools, which makes the effect still worse.

It is the usual custom to build generators of standard design with a liberal number of turns in the series field coils, and to adjust them to suit conditions by putting in a shunt of german silver, &c., across the series field terminals, which by-passes part of the current. Now, if this shunt be replaced by a choke coil having the same ohmic resistance as the shunt and a self-induction somewhat greater than the series field coils, the latter will for sudden increase in load be compelled to take a larger part of the current, thus to a greater or less extent preventing the drop in voltage and consequent blink in the lights.

It will be plain that for slow changes of load this apparatus will act as if it were only a plain resistance shunt, and will, therefore, not raise the voltage above what it should be.

Cricket.—On August 6th a cricket match was played on the Smethwick Cricket Ground, between the first eleven of the Birmingham Corporation Tramways, and the Smethwick Power Station Staff of the Birmingham and Midland Tramways Joint Committee, the Smethwick Staff proving the victors by 17 runs. The Smethwick Power Station staff scored 163 runs, and the Birmingham Corporation Tramways 146 runs.

Meat Curing by Electricity.—According to the *Electrical World*, a company has been formed to work a system of curing meats with the aid of electrical energy. The old method of soaking the meat in brine has not been changed, but with the aid of this apparatus it is claimed that the salt will penetrate the meat in two or three days, whereas it has heretofore required about 20 days. It also does away with the work of handling the meat, to a great extent, and ensures sanitary conditions in the plant. It is said that the system and apparatus have been thoroughly tested in one of the packing plants in Cincinnati, and that the owners of the plant are enthusiastic in their recommendation of the results.

Institution and Lecture Notes.—Ohio Electric Light Association.—Next week (August 25th to 27th) this Association holds a three days' annual convention (the fourteenth) at Put-in-Bay Island, Lake Erie. The following list of subjects is interesting as showing the problems that are uppermost in the minds of American electric light officials:—

"Should Central Stations Do Wiring?"
"Why Municipal Ownership of Lighting Stations has not been a Success."
"How can We Best Increase Our Business?"
"Experience with Luminous Arc Lamps."
"Electric Signs and Other Special Uses of Electricity as an Adjunct to Profitable Station Work."
"Gas and Gasoline Competition, and Best Ways to Meet It."
"Illuminating Engineering."
"Best Ways and Means of Keeping Out and Getting Out Private Plants in Central Station Territory."
"The Gas Engine in Central Station Work."
"Gas-Producer Plants and Oil Engines and their Results."

Report upon the experience of a large number of central station men on the tungsten lamp.

Liverpool and District Electrical Association.—On Saturday, August 15th, a party of members of the above Association paid a visit to the Grafton Street Pumping Station of the Liverpool Hydraulic Power Co.

Importation of Electrical Instruments into Turkey.—The Board of Trade are in receipt, through the Foreign Office, of information to the effect that the prohibition of the importation into Turkey of electrical instruments has been withdrawn.—*Board of Trade Journal.*

The "Times" and the Electrical Outlook.—It is not always that we are in agreement with the engineering correspondent who contributes the "Electrical Notes" to the *Times*, but the following comments from his pen, in Wednesday's issue, form interesting reading, and we should say are in the main a fairly correct view of the prospect:—"The prospects of the electrical engineering business, now in the most depressed condition ever known, are extremely difficult to estimate: but while many experienced authorities see no hope of revival, there are at the same time certain indications of coming activity. It is a curious financial phenomenon that in times of general industrial prosperity it is more difficult to raise capital for such purposes as electric traction and supply schemes than at other periods. This is explained, no doubt, by the tendency to reinvest profits in the industry which is producing them. Now that there is no such strong attraction in the direction of textile or other great departments of manufacturing, a large amount of accumulated profit is awaiting investment, and we hear accordingly of light railway schemes, motor-cab companies, power supply undertakings, and so forth, which, if they succeed in raising capital, can only do so by drawing upon this abundant store of profit earned during the past few years in certain great industries like textile manufacturing and coal mining. Probably, therefore, electrical firms may find openings for trade in this way. There is, moreover, an improving prospect in the direction of electrified suburban railways. Both the East London Railway and the North London Railway appear to have decided the matter in principle, and to be only awaiting favourable opportunity; and the experimental electric route of the London, Brighton and South Coast Railway may be expected to exercise a profound influence on the policy of all the suburban lines. Another source of modest optimism for electrical contractors is to be found in the general trade depression which directs the attention of manufacturers, colliery-owners, and others more anxiously and determinedly towards securing any gain in economy and efficiency that electrical equipment can give them."

Educational Notes.—HACKNEY TECHNICAL INSTITUTE. The new session (evening lecture and laboratory courses) commences on September 21st.

UNIVERSITY OF GLASGOW.—An announcement concerning the work of the new session, which opens on October 12th, appears among our advertisements to-day.

New Technical Institute in New Zealand.—A new technical school is being erected at Auckland, New Zealand, at a cost of £30,000. The school will have a plant of its own in the basement for the generation of electricity for lighting and other purposes. Two large lecture halls, one for electrical, and the other for mechanical engineering students, are included in the plans.

Electrical Football League.—A Council meeting of this League will be held at 19, Carnaby Street, W., this evening, at 7 o'clock.

Electricity in Farming.—Mr. Thomas W. Lee, formerly general passenger agent of the Delaware and Lackawanna Railroad, is cultivating almost entirely by electric power a tract of 3,000 acres in the vicinity of Idaho Falls. By means of a portable reel of conductors, connection can be made at various points to supply mains for almost any agricultural operation, including haulage of crops from field to barn.—New York *Electrical World*.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—MR. A. R. HOWDEN, of the Dundee Corporation Electrical Station, who has been appointed superintendent of the electricity station at Dumbarton, has been presented by his colleagues with a set of compasses. Mr. Charles Lamb, the distribution engineer, made the presentation.

The Doncaster T.C. has increased the salary of MR. G. A. ROBERTS, assistant at the Electricity Works, from £150 to £200 per annum by annual increments of £12 10s.

MR. A. H. M'KAY, mains superintendent in the Aberdeen Corporation Electricity Department, was on August 7th made the recipient of gifts from the staff and employés, on the occasion of his marriage.

MR. ROLAND E. WAY, late senior shift engineer at the East Sussex County Asylum Electricity Works, has been recently appointed by the Bikanir State Government as station superintendent for their electric light and power station at the capital. Mr. Way sailed for India on the ss. *Macedonia* on June 23rd, and took up his duties under the State Electrical Engineer on July 13th.

On Friday last, at Stirling Electricity Works, MR. J. W. PAPWORTH, burgh electrical engineer, was presented by the staff with a beautiful inlaid barometer on the occasion of his marriage, which was to take place yesterday, 20th inst. Mr. W. Towers, in name of the staff, made the presentation.

Tramway Officials.—The Tramway Committee of Dundee recommends that the salary of MR. PETER FISHER, the manager, be increased from £500 to £600 per annum. The Convener explained that the reason for the increase was the expansion of the system and the fact that during Mr. Fisher's managership, the undertaking had been singularly successful.

The tramway manager of Aberdeen, having applied for an increase of salary, the Tramways Committee reported that it had been proposed to increase his salary from £300 to £400, but that this proposal was defeated at the committee meeting. A letter was read from the manager, withdrawing his application, in view of the finding of the committee. The Tramways Convener remarked that, in his opinion, the Corporation were not paying the manager the standard rate of wages.

General.—At the Warrington Coroner's Court on Monday, MR. FRANK JORDAN, electrical engineer, in the employ of the Warrington Corporation, was presented by Mr. S. Brighouse (coroner) with the Royal Humane Society's testimonial, inscribed on vellum, for gallantly attempting the rescue of Hugh Leshman Parr, who was drowned in the River Mersey on June 1st. It appears that a Mr. Yeomans (who also received the certificate) had, while fully dressed, jumped into the river and got hold of Parr, but, owing to his being seized by the latter, he was compelled to release him. In the meantime Mr. Jordan, on the other side of the river, heard the screams, and immediately jumped into the water. He dived several times to recover the body, but his gallant efforts were all in vain.

A gathering of the engineering staff of the Cape Town Post Office was held on July 17th, to bid farewell to MAJOR J. P. EDWARDS, Chief Engineer and Electrician, Postal Telegraphs, Cape Colony, and to present him with a silver tea and coffee service on the occasion of his retirement on pension, after a service extending over 43 years. Mr. Edwards joined the English telegraph service in 1865, was transferred to the engineering branch in 1870, and in 1878 acted as personal assistant to Mr. (now Sir) W. H. Preece. He joined the Cape service in 1879 as superintendent in charge of the Cape Town instrument room. In 1886 he became Postmaster of Fort Beaufort; in 1891 Postmaster of King William's Town; Assistant Surveyor, Midland district, 1892; and Chief Engineer and Electrician in 1894.

On Saturday, August 8th, at Swansea, a smoking concert was held to celebrate the promotion to a Bolton appointment of MR. C. G. ROACH, who has been in charge of the G.P.O. (Swansea Section) Engineering Department for over seven years. Gold chains were presented to Mr. and Mrs. Roach by the engineering, telegraph and telephone staffs.

On August 10th, MR. JAN ROOTHAAN, the head of the drawing office at Messrs. Ferranti, Ltd, Hollinwood, was presented by the staff with a valuable Canteen, to commemorate his approaching marriage.

NEW COMPANIES REGISTERED.

Sparks (Sheffield), Ltd. (99,170).—This company has just been registered with a capital of £1,000 in £1 shares, to carry on the business of electrical and mechanical engineers, manufacturers of, and dealers in, electric, magnetic, telephonic, telegraphic and other appliances and apparatus, &c. The subscribers (with one share each) are:—E. C. Clayton, 302, Mushroom Lane, Sheffield, bank manager; B. Lake, 162, Thomas Street, Sheffield, painter; Mrs. M. J. Horton, 11, Broomhall Street, Sheffield; H. T. Magnead, 120, Duchess Road, Sheffield, railway guard; E. Swinden, 65, Burcot Road, Sheffield, glass manufacturer; J. M. Mason, 24, Hounsfield Road, Sheffield, draper; J. B. Kesteven, 8, Bank Street, Sheffield, solicitor. Private company. The number of directors is not to be less than two or more than five; the first are Mrs. M. J. Horton, E. C. Clayton and B. Lake. Registered office, 11, Broomhall Street, Sheffield.

Mershon Insulator (High Tension) Syndicate, Ltd. (99,143).—This company was registered on August 8th, with a capital of £20,000 in £1 shares, to acquire certain rights in connection with an invention relating to improved high-tension insulators, and to carry on the business of an electric power and supply company in all its branches. The subscribers (with one share each) are:—M. McQueen, 14, Campden House Road, Kensington, W., solicitor; C. St. J. G. Miller, 53, Oxford Terrace, W., solicitor. Private company. The first directors (to number not less than two or more than seven) are R. D. Mershon (permanent, subject to holding 500 shares), H. W. Fox, M. F. Armstrong, W. A. Wills, W. Praeger, and A. Scott. So long as Earl Dysart is a shareholder, he may nominate one director, W. Praeger being his first nominee. Remuneration, 1 guinea each per board meeting attended (personally or by alternate), and 5 per cent. of the net profits, divisible.

W. Seymour, Ltd. (99,208).—This company was registered on August 14th, with a capital of £1,050 in 1,000 preference shares of £1 each and 1,000 ordinary shares of 1s. each, to adopt an agreement with W. Seymour to acquire the business carried on at 1 and 7, Ellis Street, Sloane Street, S.W., and to carry on the business of electrical, mechanical, sanitary, gas, hot water and motor engineers, founders, smiths, workers of electricity, &c. The subscribers (with one preference share each) are:—Mrs. E. G. E. Seymour, Edensor, Church End, Finchley, N.; A. F. Davies, 21, Telcott Road, Chelsea, S.W., clerk. Private company. Table "A" mainly applies. Registered office, 1, Ellis Street, Sloane Street, S.W.

General Railway Signal Co., Ltd. (92,155).—This company was registered on August 10th, with a capital of £100 in £1 shares, to carry on the business of railway signalling engineers, manufacturers and installers of and dealers in signal appliances, railway engineers and contractors, electricians, electric and pneumatic engineers, &c. The subscribers (each with one share) are:—J. Mortimer, 24, Grange View, Leeds, engineer; G. Macleod, Trent Cottage, Gledhow, Wood Grove, Roundhay, Leeds, insurance inspector; F. Doyle, The Poplars, Gledhow, Leeds, fire superintendent; P. Chadwick, 47, Caledonian Road, Leeds, accountant; W. H. Revz, 19, Blenheim Palace, Leeds, cashier; S. Wall, 15, Cranbrook Avenue, Beeston Hill, Leeds, insurance clerk; W. Rushforth, 54, Kingston Road, Leeds, insurance superintendent. Private company. Table "A" mainly applies.

Thorpe Meter Syndicate, Ltd. (99,191).—This company was registered on August 13th, with a capital of £9,000 in £1 shares (3,000 founders'), to acquire from W. B. Thorpe an invention relating to an electricity meter, and to turn the same to account. The subscribers are:—W. B. Thorpe, 62, Nightingale Lane, Balham, S.W., electrical engineer, 3,000 founders' shares; H. P. Miles, Inns of Court Hotel, Holborn, W.C., gentleman, 1,000 ordinary shares. Private company: The first directors are J. M. Gatti (436, Strand, W.C.), H. P. Miles and E. A. de Paiva, J.P. (22, Nightingale Lane, Balham, S.W.). Registered office, 11, Victoria Street, S.W.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Switchgear Co., Ltd. (Birmingham) (85,405).—Second debenture, dated July 7th, 1908, to secure £2,000, charged on company's property, present and future, including uncalled capital, has been registered. Holders:—Cowans, Ltd., 4, Queen Victoria Street, E.C.

Electricity Supply Co. for Spain, Ltd. (29,103).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date, and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars:—Two charges on realty in Spain and the company's other assets, dated 1892 and 1898, securing £75,000 first and £42,500 "B" debentures, of which £32,800 and £18,200 respectively are outstanding, and Trust deed, dated November 30th, 1898, securing £250,000 consolidated debentures, of which £121,200 are outstanding.

Siemens Brothers & Co., Ltd. (14,777).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date, and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars:—Trust deed dated July 27th, 1900, securing £150,000 debenture stock.

Frinton-on-Sea and District Electric Light and Power Co., Ltd. (70,689).—This company's annual return was filed on July 27th, when 751 ordinary and 1,500 preference shares had been taken up out of a nominal capital of £6,500 in 5,000 ordinary and 1,500 preference shares of £1 each. £1 per share has been called up, resulting in the receipt of £2,251. Mortgages and charges, £6,100.

Trafford Power and Light Supply (1902), Ltd. (72,601).—Deed of exchange dated July 23rd, 1908 (supplemental to a certain indenture dated October 14th, 1901, and to a trust deed dated February 14th, 1902, securing £75,000 first mortgage debenture stock), has been registered. This deed has been executed for the purpose of effecting an alteration in the boundaries of certain land in Trafford Park Road, Trafford Park, near Manchester, conveyed by W. T. Glover & Co., Ltd., to the Trafford Power and Light Supply, Ltd. Trustees: North of England Trustee Debenture and Assets Corporation, Ltd.

Brisbane Electric Tramways Investment Co., Ltd. (67,853).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date, and not required to be registered under Sec. 14 of the Companies' Act, 1907, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars:—Trust deed dated November 21st, 1900, securing £400,000 first debenture stock.

Evershed & Vignoles, Ltd. (43,206).—This company's annual return was filed on July 10th, when the entire capital of £30,000 in £10 shares, had been taken up and paid for in full. Mortgages and charges: £11,400.

Hindhead and District Electric Light Co., Ltd. (75,361).—This company's annual return was filed on June 25th, when 12,706 shares had been taken up out of a nominal capital of £15,000 in £1 shares, £1 per share has been called up and paid on 2,206, and £10,500 is considered as paid on the remainder. Mortgages and charges: nil.

Potteries Electric Traction Co., Ltd. (57,968).—This company's annual return was filed on July 17th, when 245,000 ordinary and 245,000 preference shares had been taken up out of a nominal capital of 600,000 in 300,000 ordinary and 300,000 preference shares of £1 each. £1 per share has been called up on 178,340 ordinary and 245,000 preference, and £423,340 has been received. 66,660 shares are considered as fully paid. Mortgages and charges: £245,000.

City of London Electric Lighting Co., Ltd. (34,406).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date, and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars:—Trust deed dated February 26th, 1894, securing £400,000 (not more than £500,000 authorised).

Western Telegraph Co., Ltd. (6,886).—This company's annual return was filed on June 3rd, when 207,930 shares had been taken up out of a nominal capital of £2,500,000 in £10 shares. £10 per share has been called up on 130,000, resulting in the receipt of £1,300,000. £779,300 is considered as paid on 77,930. Mortgages and charges: £800,000.

Tramways and Light Railways Estates Co., Ltd. (65,201).—This company's annual return, made up to June 24th, has been filed. 5,022 shares have been taken up out of a nominal capital of £100,000 in £10 shares. £2 per share has been called up, resulting in the receipt of £10,044. Mortgages and charges: nil.

West African Telegraph Co., Ltd. (21,626).—This company's annual return was filed on June 17th, when 23,109 shares had been taken up out of a nominal capital of £400,000 in £10 shares. £231,090 has been received. Mortgages and charges: nil.

Barnsley and District Electric Traction Co., Ltd. (72,962).—This company's annual return was filed on June 11th, when 4,007 ordinary and 4,400 preference had been taken up out of a nominal capital of £50,000 in 5,000 ordinary and 5,000 preference shares of £5 each. £42,035 has been received. Mortgages and charges: £21,000.

Globe Telegraph and Trust Co., Ltd. (7,465).—This company's annual return was filed on July 21st, when 18,127 preference and 18,127 ordinary shares had been taken up out of a nominal capital of £5,000,000 in 250,000 preference and 250,000 ordinary shares of £10 each. £10 per share has been nominally called up. £438,115 5s. has been received in cash, and £3,167,450 is considered as paid on 316,745 shares. Mortgages and charges: nil

Calcutta Tramways Co., Ltd. (14,764).—This company's annual return was filed on June 11th, when 137,610 ordinary and 44,027 preference shares had been taken up out of a nominal capital of £950,000 in 140,000 ordinary and 50,000 preference shares of £5 each. £2 per share has been called up on 4,400 ordinary, £2 10s. per share on 8,000 ordinary, £3 10s. per share of 22,000 ordinary, £5 per share on 79,490 ordinary, and £5 per share on 44,027 preference. £728,085 has been received, and £185,100 is considered as paid, being £5 per share on 23,780 ordinary, £3 per share on 4,400 ordinary, £2 10s. per share on 8,000 ordinary, and £1 10s. per share on 22,000 ordinary. Mortgages and charges: £350,000.

CITY NOTES.

Para Electric Railways and Lighting Co., Ltd.

Sir W. Evans-Gordon presided recently at the meeting of this company, held at 20, Birchin Lane, E.C., and, in moving the adoption of the report, he dwelt upon the past history, the present position, and future prospects of the undertaking. The constructional operations commenced on August 15th, 1906. Messrs. White, the contractors, had overcome the many difficulties which had confronted them from the outset, and the whole 35 miles (single track) had been converted from inefficient mule and horse traction. Exclusive of several cars required for special purposes, the equipment consisted of 68 electric motor cars, in addition to a number of old cars converted for use as trailers during times of extra pressure. The report and accounts dealt with the year ended November 30th, 1907. They, therefore, covered the time when the confusion and disturbance resulting from reconstruction were at their height. The board fully anticipated that the receipts from the tramways would suffer, and that working expenses would be high during this period. The actual results from the operation of the undertaking for the two years during which it had been in the company's hands were as follows:—For the year ended November 30th, 1906, the gross receipts from the tramways were £136,166, as compared with £137,098 for 1907, and from lighting £63,728 compared with £67,485. The net receipts from the tramways were £22,132 in 1906, and £16,794 in 1907, and from lighting £27,636 and £24,838 respectively. Although the gross receipts had, on the whole, come up to expectations, the cost of operation, as they all knew it would be, was extremely heavy—namely, for 1906 (animal traction), 83·74 per cent., and for 1907, 94·96 per cent. The climate of Para was most disastrous to mules and horses, glanders being epidemic, while the cost of feeding and management was very high. With regard to the mortality among the animals, the replacement had cost the company £13,493 in 1906, and £13,649 in 1907. The total cost of the animals, including fodder, shoeing, stable wages and veterinary officer, amounted to £54,545 in 1906, and to £48,768 in 1907. These sums equalled 48 per cent. and 41 per cent. of the total operating expenses of the tramways. This costly item would now entirely disappear from the accounts, and although the cost of operating by electricity would replace it, and coal was expensive in Para, still, the motive power for working the line should cost not much more than one-third of the outlay on animals. The company had been affected by other unfavourable factors. The city of Para had suffered and was still suffering from a severe financial crisis. Its prosperity mainly depended upon the rubber industry. The product was very largely sold in the United States, and the recent panic there paralysed the trade, the importers being unable to take delivery of the rubber crop. In these special and temporary circumstances the municipality approached the company, and the directors felt it expedient to agree to a compromise and to accept bonds for a part of the amount due to the company for public lighting. During the period covered by the report a very small section of the tramways—namely, 7½ out of 35 miles—was being worked for a few months only by electricity, and the traffic receipts remained almost stationary. From November, 1907, up to the first week in June, 1908, there was a slight falling off in the gross receipts of, roughly, £600. This was probably accounted for by the disturbance due to reconstruction and to the financial crisis to which he had referred. From the time, however, that the lines had been operated by electricity, namely, since June this year, this small reduction had not only been made up, but the receipts to date compared with the corresponding weeks for last year showed an increase of, roughly, £1,500. In other words, the tram receipts had increased by some £2,100 in the last seven weeks. The directors had reason to hope that this increase would continue, and that, as the prosperity of the town recovered, the improvement would be more and more marked. With regard to the supply of light and power, the demand had increased beyond the company's power of supply, and a new unit of 450 KW. would shortly be shipped. The entire system of lighting was in course of reconstruction. After full consideration, the directors decided to incur the large initial outlay of replacing the old overhead feeders by underground cables, involving the laying of 23,472 yards of cable, which had been completed, and it only remained to transfer the transformers to the underground system. The directors believed that this outlay would be justified by the results when the new system was in working order. Taking the past results of the tramway and lighting together, the board felt justified in estimating that the gross receipts for the first complete year, commencing December 1st, 1908, would be £220,000, from which they had to deduct the probable operation expenses of £132,000. These they had taken at 60 per cent., which they thought a safe figure. Deducting £5,000 for London and general expenses, this would leave an estimated profit of £83,000.

Mr. Hubert Ansell seconded the motion, and it was adopted.

Willans & Robinson, Ltd.

A general meeting of the debenture-holders of this company was held on Friday of last week at the Cannon Street Hotel, Mr. Mark Robinson presiding, for the purpose of considering the advisability of passing the following resolution for selling the Queen's Ferry works:—

"That the directors are hereby authorised to sell the company's leasehold interest in the Ferry Works, Queen's Ferry, Flintshire, as set out in the third schedule of the trust deed, dated May 23rd, 1902, at a price to be approved by a valuer, to be nominated by the trustees for the holders of debenture stock, and that the sum or sums realised on such sale shall, subject to the approval of the trustees for the holders of debenture stock, be invested in securities, applied for the purchase of freehold property, or used for the erection of buildings or purchase of plant for the purposes of the company's business, and that the rights of the debenture-holders be and they are hereby modified accordingly."

The Chairman, in moving the resolution, said that, in the circular which had been sent out with the notice of the meeting, the board had explained very fully the reasons which had induced them to take the course now suggested. He need not go into the whole history of the Queen's Ferry works, which had always been a "white elephant" to the company. Unfortunately, the money loss which

those works occasioned them four years ago coincided with a great falling off in the profits of the business at Rugby. That condition of affairs prevented them finding the necessary money to complete the equipment of the Queen's Ferry works, or to raise the money by an issue of fresh capital. The first consideration of the directors was, therefore, to conserve the financial position of the company and the security of the debenture-holders, and mainly owing to the large reserve which they had accumulated in their prosperous days, they succeeded in their endeavours, even in those very dark days, to keep their head above water, and he believed he was correct in saying that they had never had an overdraft at the bank, and had never missed a cash discount. As it was not in their power to complete the Queen's Ferry works, it was evidently in their interest to get rid of them, and they had left no stone unturned to bring that about. In order to assist a private sale, they had kept the works going in order that they might be offered as a going concern, and that had involved them in a considerable annual loss. One of the subsidiary departments of the intended business there—the manufacture of a special quality of steel had proved successful, and by spending more money upon it, it might be made a good thing, but for want of funds it could only be carried on on a very small scale, and though the profits, such as they were, were satisfactory, there was no chance of their covering the general charges. Up to the present they had faced that annual loss as a probable means of bettering their chance of selling the place as a going concern, but it was evident that that experiment could not go on indefinitely. The board had come to the conclusion that the time had arrived when the business must be discontinued and the works offered by auction at such a reserve as a competent professional adviser might recommend as giving them a good chance of their selling. That opinion, he might say, was confirmed and supported by the trustees. That a great loss must be incurred, in comparison with the cost of the place was obvious, but after all the value of the security to the debenture-holders was what it would fetch in the open market, and if it was once recognised to be necessary to dispose of the place, the sooner it was done the better their chance. The resolution provided that the sum realised by the sale of the specifically mortgaged property might be invested, subject to the approval of the trustees, in securities, freehold property, new buildings for the company, or in the purchase of plant. All the company's plant was, of course, covered by the debenture-holders' mortgage, but not quite in the sense in which freehold or leasehold land and buildings were secured to the debenture-holders. Although it was desirable in the company's interest, and consequently in that of the debenture-holders' security, that there should be some elasticity possible in dealing with the proceeds of the sale, and that some plant, which was much needed at the Rugby works, should be purchased, it had never been the intention of the trustees to permit the application of the whole of the money from the sale to such purposes. They had, therefore, decided to alter the resolution as printed by inserted the following words: — "Provided that not more than one-third of such proceeds of sale shall be applied in the purchase of plant." The board were in cordial agreement with that limitation, and no purchase of plant would be made without consultation with the trustees, and with their full approval. At the end of 1907 the valuation of their freehold premises, plant and machinery at Rugby and Thames Ditton—probably a very conservative estimate—was £315,641, and that took no account of the value of Queen's Ferry, nor did it take account of the other items which made up the total of £749,443 on the credit side of their balance-sheet. As the entire debenture debt was but £246,154, and as the trustees held investments, the cost price of which amounted to £28,983, he thought they would agree that the debentures were a very well covered security whatever might happen to Queen's Ferry.

Mr. M. H. Lockey, in seconding the resolution, said he thought the directors were doing the right and only thing possible for the preservation of the interests of the debenture-holders.

Mr. Merton suggested that instead of investing the proceeds of the sale of Queen's Ferry in additional plant, it would be better to buy up as many of the debentures as possible.

The Chairman said that, personally, the suggestion struck him as a very good one, and one which, when the sale was completed, he would be very pleased to bring to the notice of the trustees, who would have the power of deciding whether it should be carried out.

After some further discussion, the resolution as amended, was put to the meeting, and carried *nem con.*, two debenture-holders intimating that though they did not vote for they would not vote against. A formal poll was subsequently taken, when the Chairman announced that £144,921 of debentures were represented at the meeting in person or by proxy, and that votes for £136,585 had been polled in favour of the resolution, which he therefore declared carried.

Baker Street and Waterloo Railway Co.

The half-yearly meeting of this company was held at Hamilton House, E.C., on August 10th, Sir Geo. S. Gibb presiding. In moving the adoption of the report (see Electrical Review, August 7th, p. 228), he congratulated them upon the very satisfactory progress of the undertaking. They had reached quite an eventful period in the undertaking, as for the first time they entered the ranks of dividend-paying railways. They were able to pay the full 4 per cent. on the preference shares, and also out of their own resources to declare ¾ per cent. on the ordinary share capital of the company. They had just completed their fourth half-year since the railway was opened, and he believed that in that period their railway showed a larger percentage of growth in business than was ever previously shown by any tube railway. That feature of continued growth was very encouraging. During the period under review they had carried nearly 13 million passengers, being an increase of three millions, or a little over 30 per cent., as compared with the corresponding six months of 1907. This increase included 1,871,140 passengers carried at workmen's fares, constituting about 14 per cent. of the total number carried, but they yielded an average of only 1d. per passenger. The explanation of the relatively good growth in their traffic was to be found in the location of the railway. The railway had created an entirely new facility; it did not depend, as did so many new lines, on the diversion of traffic from other routes. It was not a competitive railway. It was true that they had some tram and omnibus competition over parts of the railway. When the railway and its facilities were fully known, the railway would possess the nearest approach to a monopoly of the traffic for which it catered that was possible under the conditions of a great city. The development of through traffic was especially satisfactory. They had through bookings with nine different companies, and out of a total traffic of about 13 million passengers about 4,750,000, or 36 per cent., had been through passengers travelling with through tickets. The through traffic exchanged with the Central London Railway had been specially satisfactory, amounting to 40,000 passengers per week. Their exchange with the Piccadilly Tube had been 55,000 per week, and with the City and South London about 30,000 per week. He watched the development of through traffic with great interest, because it was undoubtedly in the general development of traffic movement, not on one line only, but on all lines, and by close harmony of working and co-operation in advertising and in working, that the best hope for the prosperity of the urban railways in London lay. He sincerely hoped that the era of narrow jealousy and foolish fighting had passed away, but they must be content with a smaller yield from a through passenger than they got from a local passenger. On the "Bakerloo" Railway the average fare from local passengers, including workmen, was 1·55d., while their average receipt from their proportion of through traffic was only 1·36d. per passenger. The average receipt from all traffic, through and local, was 1·48d. per passenger, and this covered the use of a railway 4¼ miles in length, so that each passenger contributed, on the average, about ⅓d. of gross revenue per mile of railway worked, and probably about ¼d. per mile for the actual distance he travelled. Their train service varied from a two-minute interval at the busiest hours to a three and a-half minute interval at the slack hours. He felt confident that the right policy for a railway in course of development like this was to run the best possible service, even although at the moment it might be in excess of traffic requirements, because it was only in this way that the traffic could be built up and future prosperity assured. With regard to the Paddington extension, the directors were not yet prepared to make a definite recommendation. The matter was still under the consideration of the board, who hoped to be in a position to make a recommendation on the subject at the next half-yearly meeting.

Sir Algernon West seconded, and the report was adopted.

Stock Exchange Notices.—Application has been made to the Committee to appoint a special settling day in and to grant a quotation to—

Anglo-Argentine Tramways Co., Ltd.—£565,000 4 per cent. debenture stock.

And to allow the following securities to be quoted in the Official List:—

West Kootenay Power and Light Co., Ltd.—£240,000 first mortgage 6 per cent. 35-year sinking fund gold coupon bonds of £100 each, Nos. 1 to 2,400.

The Committee has ordered the undermentioned securities to be quoted in the Official List:—

United Electric Tramways of Monte Video, Ltd.—67,200 ordinary shares of £5 each, fully paid, Nos. 80,001 to 147,200; and 70,000 6 per cent. cumulative preference shares of £5 each, fully paid, Nos. 1 to 42,064 and 42,565 to 70,500.

Vickers, Sons & Maxim, Ltd.—£1,000,000 5 per cent. third mortgage debentures of £100 each, Nos. 1 to 10,000, in lieu of the scrip now quoted.

Chloride Electrical Storage Co., Ltd.—It is reported that the profits for the year ended June 30th were £24,945. A dividend of 10 per cent. is proposed, and the transfer of £2,000 to the reserve, increasing it to £15,000; £10,612 is carried forward.

Fairbairn, Lawson, Combe, Barbour, Ltd.—Interim dividend on the preference and ordinary shares at the rate of 5 per cent. per annum for the half-year ended June 30th.

Prospectus.—*Rangoon Electric Tramway and Supply Co., Ltd.*—This company was last week offering for subscription an issue of 10,000 6 per cent. £5 cumulative preference shares at a premium of 2s. 6d. per share, for the purpose of providing for extensions of the company's undertaking. The list was to close on August 14th.

Claud Hamilton, Ltd.—Mr. Alex. J. Ferguson, C.A., presided at the annual meeting, held at Glasgow the other day, and moved the adoption of the report, which recommended the payment of a dividend of 7½ per cent., free of income-tax, on the ordinary capital of the company, after making provision for depreciation, carrying forward substantial amounts to the various reserve funds, and paying a dividend of 5 per cent. on the ordinary shares. The report was adopted, and Mr. H. Prosser was re-elected a director.

South American Light and Power Co., Ltd.—The directors recommend a dividend of 2 per cent. (4½d. per share) on the ordinary shares for the past year, carrying £167 forward.

MARKET QUOTATIONS.

Wednesday, August 19th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt.	5/-	..
a ,, Nitric	per cwt.	22/-	..
a ,, Oxalic	per cwt.	38/-	..
a ,, Sulphuric	per cwt.	5/6	..
a Ammoniac, Sal	per cwt.	42/-	..
a Ammonia, Muriate (crystal)	per ton	£33 10	..
a ,, ,,	per ton	£30	..
a Bleaching powder	per ton	£5 10	..
a Bisulphide of Carbon	per ton	£18	..
a Borax	per ton	£16	..
a Copper Sulphate	per ton	£21	..
a Lead, Nitrate	per ton	£28	..
a ,, White Sugar	per ton	£27	..
a ,, Peroxide	per ton	£32	..
a Methylated Spirit	per gal.	2/6	..
a Potassium Bichromate, in casks	per lb.	8½d.	..
a Potash, Caustic (75/80 %)	per ton	£30	..
a ,, Chlorate	per lb.	8½d.	..
a ,, Perchlorate	per lb.	9d.	..
a Potassium Cyanide	per lb.	7d.	..
a Shellac	per cwt.	125/-	..
a Sulphate of Magnesia	per ton	£4 10	..
a Sulphur, Sublimed Flowers	per ton	£6 10	..
a ,, Recovered	per ton	£5 10	..
a ,, Lump	per ton	£5	..
a Soda, Caustic (white 70 %)	per ton	£10 15	..
a ,, Chlorate	per lb.	5½d.	..
a ,, Crystals	per ton	£3 5	..
a Sodium Bichromate, casks	per lb.	8d.	..
a ,, Cyanide (basis 100 %)	per lb.	7d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots	per ton	£80	..
b ,, Wire, in ton lots	per ton	£180	..
b ,, Sheet, in ton lots	per ton	£128	..
n Babbitt's metal ingots	per ton	£50 to £130	..
c Brass (rolled metal 2" to 12") basis	per lb.	6¾d.	¼d. dec.
c ,, Tube (brazed)	per lb.	9d.	¼d. inc.
c ,, (solid drawn)	per lb.	8d.	¼d. inc.
c ,, Wire, basis	per lb.	6¾d.	..
c Copper Tubes (brazed)	per lb.	9¾d.	¼d. inc.
c ,, (solid drawn)	per lb.	9¾d.	¼d. inc.
g Copper Bars (best selected)	per ton	£74 to £76	inc.
g Copper Sheet	per ton	£74 to £76	inc.
g ,, Rod	per ton	£74 to £76	inc.
c ,, (Electrolytic) Bars	per ton	£64	£1 10 inc.
c ,, ,, Sheets	per ton	£80	£1 10 inc.
c ,, ,, Rod	per ton	£69	£1 10 inc.
c ,, ,, H.C. Wire	per lb.	8¼d.	¼d. inc.
f Ebonite Rod	per lb.	8/8	..
f ,, Sheet	per lb.	8/-	..
n German Silver Wire	per lb.	1/6	..
h Gutta-percha, fine	per lb.	5/6 to 6/6	..
h India-rubber, Para fine	per lb.	4/-	1¼d. inc.
i Iron Pig (Cleveland warrants)	per ton	51/- to 51/6	inc.
l ,, Wire, galv. No. 8, P.O. qual.	per ton	£14	..
g Lead, English Ingot	per ton	£13 15 to £14	..
m Manganin Wire No. 28	per lb.	8/-	..
g Mercury	per bot.	£7 17 6	2/6 dec.
d Mica (in original cases) small	per lb.	6d. to 1/-	..
d ,, ,, medium	per lb.	2/6 to 4/-	..
d ,, ,, large	per lb.	4/6 to 8/6	..
p Phosphor Bronze, plain castings	per lb.	1/- to 1/1½	..
p ,, rolled bars & rods	per lb.	1/3 to 1/6	..
p ,, ,, strip & sheet	per lb.	1/2½ to 1/5	..
o Platinum	per oz.	86/- to 90/-	..
e Silicium Bronze Wire	per lb.	9½d.	..
r Steel, Magnet, in bars	per ton	£55	..
g Tin, Block (English)	per ton	£132 10 to £133 10	£5 dec.
n ,, Wire, Nos. 1 to 16	per lb.	1/9	½d. dec.
p White Anti-friction Metals— "White Ant" brand	per ton	£34 to £58	..
k Zinc, Sh's (Vieille Montagne bnd.)	per ton	£21 5	15/- inc.

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d F. Wiggins & Sons.
e Frederick Smith & Co.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
i Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p The Phosphor Bronze Co., Ltd.
r W. F. Dennis & Co.

Loch Leven Water and Electric Power Co.—The half-yearly meeting of this company was held in London on 11th inst. According to the *Scotsman*, Mr. J. D. Bonner, who presided, in moving the adoption of the report, said that the British Aluminium Co. held the whole of the issued capital, £750,000, and they had now agreed to subscribe for the balance authorised, and thus place themselves in the position to provide all the funds necessary for carrying out this important scheme. He had just returned from the works at Loch Leven, and he was amazed at the progress made in bringing the works to the operating stage. So great had the progress been that he was convinced they would be able to produce aluminium at Leven several months earlier than was recently contemplated. Another thing which had very much impressed him was the excellent way in which the works had been carried out. In Loch Leven works they would have a power scheme which would be a valuable asset, worth considerably more than its cost. The report was adopted.

STOCKS AND SHARES.

Tuesday Evening.

Investment markets are heavily handicapped by the pall provided by the painful dulness of Consols. Why the premier securities should continue depressed it is not easy to determine, but the fact remains, and a very slight tightening of the Money Market, every now and then, is enough to cause a fresh outbreak of trembling in an already nervous market. Each feeble rally is succeeded by a further decline; there seems to be little demand for the Funds, and this causes other investment prices to droop.

By far the most active portion of the electrical markets is that which embraces the power, light and tramway companies of what has come to be known as the Canadian group.

Home Railway stocks do not make much headway against the various conditions operating to their disadvantage. It is somewhat surprising that the Tube companies do not show better results as a consequence of the Exhibition; the Central London naturally has done, and is doing, good business, although even here the traffics fall below the estimates laid in advance by people who were evidently ultra-optimistic. The company's Deferred stock has fallen a point, while the declines in the Ordinary and Preferred merely reflect the *ex* dividend markings of last week.

City and South London has shed ¼, and Districts are the same fraction easier, although Metropolitan Consolidated is ⅜ up, allowing for the 5s. per cent. dividend, the last, it is to be hoped, of such diminutive distributions.

Great Northern, Piccadilly and Brompton 4 per cent. Debenture rose a point to 92, and Charing Cross, Euston and Hampstead Debenture is ¼ up at 83, both movements being connected with the good half-yearly reports referred to here last week.

Electricity Supply shares have moved irregularly in the few instances where any changes occurred at all. Several are caused by dividend deductions. City of London Preference gained 5s., and the Ordinary 2s. 6d., while Kensingtons at 8¼ show 5s. loss, of which 4s. is represented by dividend. Newcastle-on-Tyne Preference improved slightly.

Electric Constructions have been in some demand, and show a small rise at 8s. 9d. middle. The Brush descriptions are weak, falls occurring of 1s. 3d. in the Preference and 3¼ in the Second Debenture. The price of the latter is now about 52.

Mexican Light and Power Common stock rose 5¼ to 76, and a large trade is being done in the 7 per cent. cumulative convertible Preference stock at about 112½. The company's First Mortgage Gold bonds are 90½, and were *ex* their coupon early in this month. Mexican Electric Light Company 5 per cent. First Mortgage gold bonds are better at 86, and must not be confused with those of the Light and Power Company. Canadian General Electric Common shares and 7 per cent. Preference stock have not moved from 104 and 114 respectively. The 5 per cent. First Mortgage Gold bonds of the Electrical Company of Ontario have come into notice, the price being 85, while similar securities in the Kaministiquia Power Company are quoted at 67 for the scrip with £69 13s. 3d. paid-up.

Amongst the tramway shares, Rio Common take precedence, as regards improvement, with a rise of 3½ (making 7½ in less than a fortnight) to 62½. Mexico Tramways Common stock has put on 3 to 120, and the 5 per cent. bonds are fractionally better at 94¼. An impression is current that these two companies may possibly amalgamate, or join hands in a working agreement. Sao Paulo Tramway, Light and Power stock has advanced to 149, and the 5 per cent. First Debentures are 99.

Anglo-Argentine Tramways Second Preference hardened a shade, and Calcutta shares at last show some resistance to the declining tendency with which they have been afflicted of late. The price is 5s. better at 5½. British Electric Traction Ordinary are ⅛ lower.

Other electric traction issues to show improvement are British Columbia Deferred at 125½, and Colombo First Debentures at 91½, rises of 1 and 1½ respectively.

Indian varieties are much out of favour in consequence of the unsettled condition of the Dependency. As an instance, it may be mentioned that a seller of a small amount of Madras Electric Supply 5 per cent. Debenture stock could get a bid of no more than 82½, although the nominal quotation in the Stock Exchange Official List is 85 to 90.

National Telephone Deferred has gained 3½. Chile Oriental and Monte Video Telephone shares are all better.

Telegraph descriptions have been somewhat erratic. Eastern Extensions rose to 13, but lost half of the rise. Eastern Ordinary is ¼ up. Great Northern shares improved. Anglo-American Telegraph Ordinary and Preferred moved up, while the Deferred at 16¼ shows a ⅜ loss. Globe Telegraphs, of both kinds, picked up. Telegraph Constructions hardened, and British Insulated Debenture gained a point. The 4 per cent. Convertible bonds of the American Telephone and Telegraph Company are quoted at 92½, and were *ex* dividend last week.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1904.	1905.	1906.	1907.	Closing Quotations August 11th.	Closing Quotations August 18th.	Business done week ended August 18th, 1908. Highest	Lowest.	Rise + or Fall −	Present Yield per cent. £ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	Nil	2 — 3	1⅞ — 2¼	..	..	..	Nil
149,800	Do. do. 5 % Debs., Nos. 1 to 1,250 Red.	100	Nil	5 %	5 %	5 %	87 — 90	87 — 90	..	..	..	5 11 1
$131,551,400	American Telephone & Telegraph, Cap. Stock	$100	7¼%	7¼%	8 %	8 %	123 —127	125 —129	..	..	+2	6 4 0
53,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000	$1000	4 %	4 %	4 %	4 %	89 — 92	89 — 92	..	..	..	4 7 0
598,180	Anglo-American Telegraph	Stock	2¾%	3⅛%	3⅛%	3⅛%	57 — 60	58 — 61	..	..	+1	5 14 9
3,200,910	Do. do. do. 6 % Pref.	Stock	5⅛%	6 %	6 %	6 %	102⅛—103½	103½—104½	104⅜	103⅝	+1	5 14 10
3,200,910	Do. do. do. Deferred	Stock	Nil	⅛%	1¾%	1 %	16⅜ — 16¾	16 — 16½	16 1/16	16⅛	— ⅛	6 1 3
50,000	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	..	5 %	5 %	5 %	101 —104	101 —104	..	..	..	4 16 2
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	8 %	7⅞ — 8⅜	8 — 8¼	8 1/16	8 1/16	+ ⅛	4 14 1
2,882,376	Commercial Cable Sling. 500 year 4 % Deb. Sk. Red.	Stock	4 %	4 %	4 %	4 %	83⅛ — 86⅛	84 — 87	85⅛	85	+ ⅛	4 12 0
16,000	Cuba Telegraph	10	5	5	5	6	7⅛ — 8⅛	7⅜ — 8¼	..	..	..	7 1 2
6,000	Do. 10 % Pref.	10	10	10	10	10	15⅛ — 16⅛	15⅛ — 16⅛	16 1/16	..	..	6 1 3
12,931	Direct Spanish Telegraph, Ord.	5	4	4	4	4	3 — 3¼	3 — 3¼	..	..	..	6 3 1
6,000	Do. do. 10 % Cum. Pref. ..	5	10	10	10	10	8 — 9	8 — 9	..	..	..	5 11 1
30,000	Do. do. 4½ % Debs.	50	4½	4½	4½	4½	100—103	100 —103	..	..	..	8 14 10
60,710	Direct United States Cable	20	3½	4½	4½	4½	13½—13⅝	13½— 13⅝	13 5/16	..	..	6 4 9
50,900	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,200, R.	100	4½	4½	4½	4½	99 —101	99 —101	..	..	..	4 9 1
4,000,000	Eastern Telegraph, Ord. Stock..	Stock	7	7	7	7	134 —137	134½ —137½	136⅜	135⅜	+ ½	5 1 10
2,000,000	Do. 8½ % Pref. Stock..	100	8½	8½	8½	8½	84 — 86	84 — 86	85⅜	84⅜	..	4 1 5
1,896,706	Do. 4 % Mort. Deb. Stock. Red. ..	Stock	4	4	4	4	101½—103½	101½ —103½	103½	103	..	3 17 4
800,000	Eastern Extension, Australasia, and China Tele.	10	7	7	7	7	12⅛ — 13	12⅜ — 13⅜	13 1/16	12 15/16	+ ⅛	5 6 8
752,400	Do. 4 % Deb. Stock	Stock	4	4	4	4	99½—101½	99½—101½	..	..	..	3 18 10
269,700	East & S. Afric. Tel., 4 % Mt. Db., 1 to 8,000, red. 1909	100	4	4	4	4	99 —101	99 —101	..	..	..	3 19 3
200,000	Do. 4 % Reg. M. Debs. (Mauritius Sub.) 1 to 8,000	25	4	4	4	4	100½—102½	100½—102½	100⅝	..	..	3 18 1
181,127	Globe Telegraph and Trust	10	5⅜	5½	5½	5⅝	10½ — 11	10⅝ — 11	10½	10⅛	+ ⅛	5 14 10
181,127	Do. do. 6 % Pref..	10	6	6	6	6	13⅛ — 13⅜	13⅛ — 14	13 3/16	13⅛	+ ⅛	4 5 9
150,000	Great Northern Telegraph, of Copenhagen.. ..	10	24 %	24%	20 %	20 %	27 — 29	27⅛ — 29½	31⅛	28½	+ ½	5 8 1
19.600	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,200, Red.	100	4¾%	4¾%	4¾%	4¾%	99 —101	99 —101	..	..	..	4 9 1
17,000	Indo-European Telegraph	25	18 %	18 %	18 %	18 %	56 — 59	56 — 59	..	..	..	6 7 1
$41,380,400	Mackay Companies Common	$100	1 %	2 %	3½%	4 %	69 — 73	69 — 73	..	..	..	5 9 7
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	69 — 73	69 — 73	..	..	..	5 9 7
384,190	Marconi's Wireless Telegraph	£1	Nil	Nil	Nil	Nil	⅜ — ½	⅜ — ½	9/9	..	..	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	4 %	5 %	6 %	6 %	1 — 1⅛	1 — 1⅛	..	..	+ 1/16	5 6 8
86,492	Do. do. do. 5 % Pref.	1	5 %	5 %	5 %	5 %	27/32 — 29/32	27/32 — 29/32	..	..	+ 1/32	5 8 1
2,225,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	106⅛—108½	106⅛—108½	108	107	..	5 10 7
3,735,000	Do. do. Def. Stock	100	5 %	5 %	6 %	6 %	115½—117½	119 —121	119½	116⅛	+3½	4 19 2
15,000	Do. do. 6 % Cum. 1st. Pref.	10	6 %	6 %	6 %	6 %	10 — 12	10 — 12	..	..	..	5 0 0
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	6 %	6 %	6 %	10 — 12	10 — 12	..	..	..	4 3 4
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5⅛ — 5⅜	5⅛ — 5⅜	..	..	..	4 6 11
2,000,000	Do. do. 3½ % Deb. Stock Red. ..	Stock	3½%	3½%	3½%	3½%	98½—100⅛	98½—100⅛	99	98½	..	3 7 8
1,716,598	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	102⅜—104½	102⅜—104½	103⅛	..	..	3 16 7
179,313	Oriental Telep. and Elec. 1 to 171,504, fully paid ..	1	6¾%	7 %	7 %	8 %	1 1/16 — 1 1/16	1 1/32 — 1 1/32	29/3	28/9	+ 1/32	5 19 8
50,000	Do. do. 6 % Cum. Pref.... ..	1	6 %	6 %	6 %	6 %	1 — 1⅛	1 1/16 — 1 1/16	..	..	+ 1/16	4 11 5
99,100	Do. do. 4 % Red. Deb. Stock ..	100	..	4 %	4 %	4 %	89 — 92	88 — 92	91	..	..	4 7 0
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	10	4 %	4 %	4 %	4 %	98 —101	97⅞—100½	98½	..	— ½	3 18 10
11,839	Reuter's	8	5 %	5 %	5 %	5 %	7⅞ — 8¼	7⅞ — 8¼	..	..	..	4 17 7
99,100	Telephone Co. of Egypt, 4½ % Deb. Red.	100	..	4½%	4½%	4½%	99 —102	99 —102	101	..	..	4 8 3
3,083	Submarine Cables Trust	Cert.	6 %	6 %	6 %	6 %	127 —130	128 —131	128½	..	+1	4 11 7
100,000	United River Plate Telephone	5	8 %	8 %	8 %	8 %	6¾ — 7	6⅞ — 7⅛	6⅞	6⅞	+ ⅛	5 12 3
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	4⅜ — 4⅝	4⅜ — 4⅝	..	..	..	5 8 1
30,008	W. Coast of America, 1 to 30,000 & 53,001 to 53,008	2½	Nil	Nil	2½%	2½%	1⅛ — 1 1/16	1 1/16 — 1 1/16	23/9	..	..	4 8 11
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	98 —101	98 —101	..	..	..	3 19 3
207,930	Western Telegraph, Ltd., Nos. 1 to 207,930.. ..	10	7 %	7 %	7 %	7 %	13⅜ — 14½	13⅜ — 14½	14⅛	13 27/32	..	4 19 3
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	100 —102	100 —102	101	..	..	3 18 5
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	Nil	1/16 — 1/8	1/16 — 1/8	12/-	..	..	Nil
34,563	Do. do. 6 % Cum. 1st Pref.	10	6 %	5 %	8 %	6 %	8 — 8½	8 — 8½	8⅜	..	..	7 1 2
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	Nil	£2 6	8½ — 9½	8½ — 9½	..	..	..	2 9 0
80,000	Do. do. 5 % Debs., Nos. 1 to 1,800 ..	100	5 %	5 %	5 %	5 %	100 —102	100½—102½	..	..	+ ⅛	4 17 7

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

320,000	Anglo-Argentine Trams, 10 % Nom. Cum. 2nd Pref., 260,008 to 580,097	5	8 %	8 %	8 %	9 %	8⅜— 8⅞	8⅜— 8⅞	8 3/16	8 1/16	..	5 1 5
260,007	Do. 6 % Cum. Prefs., 1 to 260,007 ..	5	5¼%	5¼%	5¼%	5⅜%	6⅛— 6⅜	6⅜— 6 7/16	6⅜	6 1/16	+ 1/16	4 9 4
266,600	Do. Permanent, 6 % Deb. Stock, 1888	100	6 %	6 %	6 %	6 %	141 —146	141 —146	145	..	..	4 2 2
295,100	Auckland E. Trams, 5 % 1st Mort. Deb. Stock ..	100	5 %	5 %	5 %	5 %	103 —106	103 —106	..	..	..	4 14 4
330,000	Babcock & Wilcox, 1 to 330,000..	1	20 %	20 %	20 %	20 %	31⅛— 31⅝	31⅛— 31⅝	76/3	75/-	..	5 1 11
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	6 %	1 1/16 — 1 1/16	1 1/16 — 1 1/16	..	..	..	3 16 10
40,000	British Aluminium, Ord., 1 to 40,000	5	7 %	7 %	7 %	7 %	2⅞ — 3⅛	2⅞ — 3⅛	57/6	..	..	10 15 4
40,000	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	3⅞ — 4⅛	3⅞ — 4⅛	..	..	..	8 4 8
30,000	Do. do. "A" 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	4⅛ — 4⅜	4⅛ — 4⅜	..	..	..	6 6 4
30,000	Do. do. 4 % Funding Certs.	5	4 %	4 %	4 %	4 %	3½ — 4⅛	3⅝ — 4⅛	..	..	..	4 14 4
288,200	Do. do. 5 % 1st Mort. Deb. Stock Red.	Stock	5 %	5 %	5 %	5 %	106 —110	106 —110	..	..	..	4 10 11
300,000	Do. do. 5½ % Loch Leven Debs. ..	100	..	..	5½%	5½%	97 —100	97 —100	..	..	..	5 10 0
400,000	British Columbia E. Rail Def. Ord. Stock ..	100	6 %	6 %	6 %	8 %	122 —127	123 —128	125	124½	+1	6 5 0
300,000	Do. 5 % Pref. Ord. Stock	100	5 %	5 %	5 %	5 %	109 —113	109 —113	112⅝	111¼	..	4 8 6
300,000	Do. 5 % Cum. Perp. Pref. Stock ..	100	5 %	5 %	5 %	5 %	104 —108	104 —108	..	..	..	4 12 7
233,000	Do. 4½ % 1st Mort. Debs., 1 to 6,950 ..	40	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
220,000	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	4½%	4½%	4½%	4½%	101 —104	100 —103	..	..	..	4 7 5
133,301	British Electric Traction	10	6 %	8 %	Nil	Nil	1⅜— 1⅞	1 1/16 — 1 1/16	..	..	— 1/16	Nil
161,437	Do. do. 6 % Cum. Pref.	10	6 %	6 %	6 %	3 %	4¼ — 4½	4 — 4½	83/9	..	— ¼	6 13 4
1,473,653	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	5 %	95 — 98	95 — 98	95½	..	..	5 2 0
528,936	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	4½%	76 — 78	76 — 78	..	..	..	5 15 5
100,000	British Insulated and Helsby Cables	5	8 %	8 %	10 %	10 %	6½ — 6⅝	6½ — 6⅝	6⅝	6½	..	7 8 2
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	6 — 6¼	6 — 6¼	..	..	..	4 12 4
500,000	Do. do. 4½ % 1st Mort. Deb. Red. ..	100	4½%	4½%	4½%	4½%	102 —105	103 —106	..	..	+1	4 4 11
212,000	British Thomson-Houston 4½ % 1st Mort. Debs.	100	4½%	4½%	4½%	4½%	96 — 98	93 — 98	..	..	..	4 11 10
400,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 475,000	5	Nil	Nil	Nil	Nil	1/16 — 1/8	1/16 — 1/8	..	..	— 1/16	Nil
1,016,853	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	4 %	43 — 48	43 — 48	..	..	..	8 6 8
50,000	‡ Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	Nil	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
50,000	‡ Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	Nil	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
105,731	Brush Electrical Engineering, Ord., 1 to 105,731 ..	½	Nil	2½%	Nil	Nil	0— ¼	0 — ¼	..	..	..	Nil
150,000	Do. do. Non-cum. 6 % Pref.	2	6 %	6 %	Nil	Nil	1/16 — 1/8	¼ — ⅜	..	..	— 1/16	Nil
125,000	Do. do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	70 — 75	70 — 75	..	..	..	6 0 0
125,000	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½%	4½%	4½%	4½%	53 — 58	50 — 54	..	..	— 3½	8 6 8
137,610	Calcutta Trams, 1 to 137,610	5	8 %	8 %	8 %	6 %	5 — 5½	5⅛ — 5⅜	5⅛	5 1/16	+ ⅛	5 4 4
30,000	Do. 6 % Cum. Pref., Nos. 1 to 29,830..	5	..	5 %	5 %	5 %	4¾ — 5¼	4⅝ — 5¼	..	..	..	4 15 8
250,000	Do. 4½ % 1st Deb. Stock..	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
35,000	Callender's Cable Construction shares	5	12½%	15 %	15 %	15 %	9½ — 10½	9⅞ — 10⅜	..	..	+ ¼	6 19 6
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	5⅜ — 5⅝	5⅜ — 5⅝	..	..	..	5 6 11
300,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	106 —108	106 —108	107⅛	107½	..	4 3 4
491,222	Cape E Trams., 1 to 491,222	1	5 %	Nil	Nil	Nil	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	4 %	6 %	8 %	12 %	1⅛ — 1¼	1⅛ — 1 3/16	29/4½	29/3	+ 1/16	7 13 8
215,045	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
1,993,610	Central London Railway, Ord. Stock	Stock	4 %	4 %	4 %	3 %	69 — 71	68 — 70 xd	69½	68½	—1	4 5 9
553,195	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	87 — 89	85 — 87 xd	85¼	..	—2	4 12 0
553,195	Do. do. Def. do.	Stock	4 %	4 %	4 %	2 %	52 — 55	51 — 54	53¼	..	—1	3 14 1
1,480,000	City and South London Railway	Stock	2¾%	1¾%	2¾%	2¾%	32½— 34½	32 — 33	33	32	—1	6 8 9

Unless otherwise stated, all shares are fully paid. † A period of nine months. ‡ From Manchester Share List.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years.				Closing Quotations Aug. 11th.	Closing Quotations Aug. 18th.	Business done week ended Aug. 18th, 1908.		Rise + or Fall —	Present Yield per cent.
		*	1904.	1905.	1906.	1907.			Highest	Lowest.		£ s. d.
85,000	Crompton & Co., Nos. 1 to 85,000	8	2½%	2½%	5 %	5 %	1⅛ — 1⅜	1⅛ — 1¼	30/-	..	..	8 13 11
100,000‡	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 11,000 of £50 Red.	..	5 %	5 %	5 %	5 %	90 — 93	90 — 93	..	..	..	5 5 11
260,000	Dick, Kerr & Co., 1 to 260,000	1	10 %	10 %	10 %	10 %	1¾ — 1⅞	1¾ — 1⅞	..	..	..	7 5 5
805,000	Do. do. 6 % Cum. Pref., 1 to 805,000	1	6 %	6 %	6 %	6 %	1 — 1¼	1 — 1¼	..	..	..	4 16 0
282,580	Do. do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	99 —102	99 —102	..	..	..	4 8 3
60,000	Dublin United Trams. (1896), 1 to 60,000	10	6 %	6¾%	6 %	6¾%	12 — 13	12 — 13	..	..	..	4 18 1
59,987	Do. 6 % Pref. between 1 and 60,000	10	6 %	6 %	6 %	6 %	12½ — 13½	12½ — 13½	..	..	..	4 8 11
99,261	Edison & Swan Utd., "A" shs., £8 pd., 1 to 99,261	5	2½%	4½%	4½%	4½%	⅞ — 1	⅞ — 1	..	..	..	16 12 6
17,139	Do. "A" shares, 01—017,139	5	2½%	4½%	4½%	4½%	1½ — 2¼	1½ — 2¼	..	..	..	8 6 9
319,475	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	76 — 79	76 — 79	..	..	..	5 1 3
72,220	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	5 %	85 — 87	85 — 87	..	..	..	5 14 11
112,100	Electric Construction, 1 to 112,100	2	4 %	Nil	Nil	Nil	⅛ — ¼	⅛ — 1/16	..	..	+ 1/16	Nil
31,890	Do. do. 7 % Cum. Pref., 1 to 31,890	2	7 %	7 %	7 %	7 %	1⅛ — 1¼	1⅛ — 1¼	..	..	..	Nil
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	5 %	7½ — 8	7⅝ — 8	..	..	..	6 5 0
200,000	Do. do 4 % Mort Deb.	Stock	4 %	4 %	4 %	4 %	84 — 87	84 — 87	..	..	..	4 12 0
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	4 %	4 %	4 %	¾ — 1	¾ — 1	..	..	..	5 0 0
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	7 %	10½ — 10⅝	10½ — 10⅝	..	..	..	6 10 5
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	5 %	102 —103	102 —103	..	..	..	4 17 1
40,000	Henley's (W. T.), Telegraph Works, Ord.	5	15 %	15 %	15 %	15 %	10½ — 11½	10½ — 11½	11½	10 11/16	..	8 18 10
40,000	Do. do. 4½ % Pref.	5	4½%	4½%	4½%	4½%	5 — 5⅛	5 — 5⅛	..	..	..	4 1 10
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½%	4½%	4½%	4½%	106 — 108	106 — 108	..	..	..	4 3 4
50,000	India-Rubber, Gutta-percha & Telegraph Works	10	5 %	10½%	10 %	10 %	15⅞ — 16⅛	15⅞ — 16⅛	..	..	..	6 1 8
87,500	†Liverpool Overhead Railway, Ord.	10	1¼%	Nil	Nil	⅜	1⅛ — 1⅜	1 1/16 — 1 1/16	..	..	— 1/16	3 16 10
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	6 %	5¾ — 6¼	5¾ — 6	..	..	— ¼	8 6 8
600,070	London United Trams. (1901), 1 to 50,007	10	6 %	8 %	8 %	8 %	6¼ — 6⅝	6¼ — 6⅝	..	..	..	4 8 11
399,930	Do. do. 50,008 to 100,000	10	6 %	8 %	8 %	8 %	6¼ — 6⅝	6¼ — 6⅝	..	..	..	4 8 11
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	5 %	6 %	6¼ — 7¼	6¼ — 7¼	6½	..	..	6 17 11
1,331,000	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	79 — 84	79 — 84	89	..	..	4 15 3
5,732,062	Metropolitan Consolidated	100	3 %	2½%	1 %	1 %	35 — 36	35½ — 36½ xd	36⅜	35⅜	..	1 7 5
2,640,914	Do. Surplus Lands	100	2½%	2½%	2¾%	2¾%	67 — 69	65 — 67 xd	66⅜	65½	..	4 2 1
3,235,000	Do. District	100	Nil	Nil	Nil	Nil	11⅜ — 12⅜	11 — 12	11⅜	..	— ⅛	Nil
314,016	Metropolitan Electric Trams., Defd.	1	Nil	Nil	Nil	Nil	3/32 — 5/32	3/32 — 5/32	..	..	..	Nil
500,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	1/16 — 1/8	1/16 — 1/8	16/-	15/-	..	6 3 1
350,000	Do. do. 4½ % Deb. Stock Red.	100	4½%	4½%	4½%	4½%	93 — 96	93 — 96	94	93	..	4 13 9
245,500	Potteries E. Trc.	1	5 %	4 %	4 %	4 %	3/32 — 5/32	3/32 — 5/32	..	..	..	8 0 0
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	3/32 — 5/32	3/32 — 5/32	..	..	..	6 13 4
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	93 — 96	93 — 96	..	..	..	4 13 9
37,350	Telegraph Construction and Maintenance	12	15 %	15 %	15 %	17½%	31 — 33	31½ — 33½	33½	31½	+ ½	6 5 5
150,000‡	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
3,599,200	Undergd. E. R., Lon., 5 % Profit Shar. S. Nts.	..	5 %	5 %	5 %	5 %	39 — 43	39 — 43	..	..	..	11 12 6
66,666	Willans & Robinson, 1 to 30,000 & 80,001 to 116,666	1	Nil	Nil	Nil	10 %	⅜ — 1½	⅜ — 1½	19/9	..	..	8 0 0
66,666	Do. 6 % C.P., 30,001 to 80,000 & 125,001 to 141,666	5	Nil	Nil	..	6 %	2½ — 3	2½ — 3	58/1½	52/6	..	10 0 0
46,404	Do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	72 — 76	72 — 76	74	73	..	5 5 3

ELECTRICITY SUPPLY COMPANIES.

15,000	Bromley (Kent) E.L. & P., 1 to 15,000	5	5½%	5½%	5½%	5½%	4½ — 5	4½ — 5	..	..	..	5 10 0
70,000	Do. do. 4½ % 1st. deb. stock	100	4½%	4½%	4½%	4½%	94 — 97	94 — 97	..	..	..	4 12 9
30,131	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10 %	10 %	10 %	10 %	7 — 8	6⅞ — 7⅞ xd	..	..	— ⅛	6 9 0
9,869	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	6⅞ — 7⅞	6⅞ — 7⅞ xd	..	..	— ⅛	4 13 4
386,876	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	98 —101	99 — 102	..	..	+ 1	3 18 5
80,000	Charing Cross and Strand Electricity Supply	5	8 %	5 %	5 %	5 %	3½ — 4	3½ — 4	78/9	..	..	6 5 0
80,000	Do. do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	4½%	4 — 4½	4 — 4½	..	..	..	5 0 0
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½%	4½%	4½%	4½%	3⅞ — 4	3½ — 4	74/4½	..	+ ½	5 12 6
445,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	95 — 98	95 — 98	95½	..	..	4 1 8
49,436	Chelsea Electricity Supply, Ord.	5	6 %	6 %	4½%	4½%	3 — 3½	3 — 3½	..	..	..	6 8 7
175,000‡	Do. do. 4½ % Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 7 5
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	6 %	6 %	6 %	9½ — 10½	9⅝ — 10½	10⅛	9 13/16	+ ⅛	5 17 1
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	11½ — 12½	11½ — 12½	12 1/16	..	..	4 16 0
400,000‡	Do. 5 % Db. Stk., Scrip. (iss. at 115) all pd.	..	5 %	5 %	5 %	5 %	122 —125	122 —125	..	..	..	4 0 0
800,000	Do. 4½ % 2nd. Db. Stk., Prov. Crts., all pd.	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
40,000	County of Durham Electrical Power, Ord.	5	£3 7 0	4 %	4 %	2 %	2⅜ — 3	2⅜ — 3	..	..	..	3 6 8
50,000	Do. do. do. 5 % Pref.	5	5 %	5 %	5 %	5 %	3¾ — 4¼	3⅝ — 4¼	..	..	..	5 17 8
40,000	County of London Electric Lighting, Ord. 1—40,000	10	4½%	5 %	5 %	5 %	7½ — 8¼	7⅝ — 8⅜	8⅛	..	+ ⅛	5 17 8
40,000	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	6 %	10½ — 10⅝	10½ — 10⅝	10 1/16	10⅜	..	5 11 8
400,000‡	Do. do. 4½ % Deb. Stock	..	4½%	4½%	4½%	4½%	106 —109	106 —109	..	..	..	4 2 7
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½%	4½%	4½%	4½%	98 —101	98 —101	98½	..	..	4 9 1
80,000	Edmundson's Electric Corporation, Ord. Shares	5	7 %	4 %	Nil	Nil	⅛ — ¼	⅛ — ¼	..	..	..	Nil
80,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	3 %	Nil	¾ — 1	¾ — 1	..	..	..	Nil
433,000	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	4½%	58 — 65	58 — 65	65	..	..	6 18 6
10,000	Folkestone, 1 to 10,000	5	5½%	5½%	5½%	5½%	4⅜ — 5⅛	4⅜ — 5⅛	..	..	..	5 4 9
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	..	5 %	5 %	5 %	5 — 5⅛	5 — 5⅛	..	..	..	4 10 0
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	96 — 99	97 —100	..	..	+ 1	4 10 11
15,000	Hove, 1 to 18,000	5	8½%	9 %	9 %	8½%	6 — 6½	6 — 6½	..	..	..	6 10 9
21,000	Kensington and Knightsbridge Electric Ord.	5	12 %	10 %	10 %	10 %	8 — 9	7⅞ — 8⅞ xd	..	..	— ⅛	5 14 3
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	94 — 97	94 — 97	..	..	..	4 2 6
10,000	London Electric Supply Corporation, Limited, Ord.	3	3 %	4 %	4 %	2½%	⅞ — 1⅛	⅞ — 1⅛	..	..	..	5 8 1
70,000	Do. do. do 6 % Pref.	5	6 %	6 %	6 %	6 %	4½ — 5	4½ — 5	..	..	..	6 0 0
74,395	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4 %	4 %	4 %	4½%	89 — 92	89 — 92	..	..	..	4 17 10
200,000	Metropolitan Electric Supply, 1 to 100,000	5	10 %	10 %	8 %	6½%	4⅝ — 5⅛	4⅝ — 5	97/6	92/6	..	6 3 11
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	4½%	4½ — 5	4½ — 5	97/6	92/6	..	4 10 0
220,000‡	Do. 4½ % 1st Mort. Deben. Stock	..	4½%	4½%	4½%	4½%	105 —109	105 —109	108½	..	..	4 2 7
250,000‡	Do. 3½ % Mort. Deben. Stock Redem.	Stock	3½%	3½%	3½%	3½%	84 — 89	84 — 89	..	..	..	3 18 8
250,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	94 — 97	94 — 97	..	..	..	4 12 9
87,500	Newcastle-on-Tyne, 1 to 87,500	5	5 %	5 %	5 %	5 %	5⅛ — 5⅜	5⅛ — 5⅜	..	..	..	6 19 2
87,500	Do. 5 % Pref., 1 to 87,500	5	5 %	5 %	5 %	5 %	5⅛ — 5⅜	5⅛ — 5⅜	..	..	+ ⅛	4 6 11
10,852	Notting Hill Electric Lighting	10	7 %	7½%	7½%	7½%	12 — 13	12 — 13	..	..	..	5 15 5
20,000	Oxford, 1 to 98 and 407 to 20,310	5	7 %	7 %	7 %	7 %	5⅞ — 6¼	5⅞ — 6⅛ xd	..	..	— ⅛	5 14 3
50,000	Do. 4 % Deb. Stock	100	4 %	4 %	4 %	4 %	95 — 98	95 — 99	..	..	..	4 0 10
40,000	St. James' and Pall Mall Electric Light, Ord.	5	14½%	12½%	10 %	10 %	7 — 8	7 — 8	..	..	..	6 5 0
30,000	Do. do. 7 % Pref. 20,061 to 40,060	5	7 %	7 %	7 %	7 %	6½ — 7½	6½ — 7½	..	..	..	4 16 7
150,000‡	Do. do. 3½ % Deb. Stock Red.	100	3½%	3 %	3½%	3½%	86 — 90	86 — 90	86	..	..	3 17 9
12,000	Smithfield Markets Electric Supply, Ord.	5	4 %	4 %	Nil	Nil	¼ — ¾	¼ — ¾	..	..	..	Nil
50,000	Do. do. do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	68 — 72	68 — 72	..	..	..	5 11 1
65,000	South London Electricity Supply, Ord.	5	4 %	4 %	3 %	4 %	2⅜ — 2⅞	2⅜ — 2⅞	..	..	..	6 19 2
120,000	South Met. Elec. Lt. & Power, Ord.	1	Nil	2½%	2½%	2½%	⅞ — 1	⅞ — 1	..	..	..	4 0 0
117,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1 — 1⅛	1 — 1⅛	..	..	..	5 12 0
200,000	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 7 5
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	5 %	1⅛ — 1¼	1⅛ — 1¼	..	..	..	16 13 4
50,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	1⅜ — 2⅛	1⅜ — 2⅛	..	..	..	10 10 6
200,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½%	4½%	4½%	4½%	82 — 86	82 — 86	..	..	..	5 5 11
110,000	Westminster Electric Supply, Ord.	5	14 %	13 %	12 %	10 %	7⅛ — 8⅛	7⅛ — 8⅛	8 3/16	..	..	5 17 8
81,279	Do. do. 4½ % Cum. Pref. (Original 5 %—Red. to 4½ % from 31st Dec., 1905)	5	5 %	5 %	4½%	4½%	5 — 5¼	5 — 5¼	5 3/32	5¼	..	4 1 10

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange. ‡ Interim Dividend.

Bank rate of Discount 2½ per cent., May 28th, 1908.

SOME GERMAN METAL-FILAMENT LAMP TESTS.

Some tests carried out on metal-filament lamps made by various German makers, and run on an ordinary alternate-current supply circuit showing voltage variation of ± 2 to 3 per cent., are described in the *Zeitschrift für Elektrotechnik und Maschinenbau*. Four Osram lamps made by the Deutsche Gasglühlicht A.-G. were tested, two being nominally for 32 Hefner c.p., and two for nominally 50 Hefner c.p. The life test on these lamps showed the following results :—

Lamp.	Volts.	Amperes.	Hefner c.p.	Hours from start.
32 c.p. Osram No. 1.	120	·36	39	0
	120	·36	41·8	226
	121	·37	41	400
	120	·37	36	600
	120	·36	36·3	800
	120	·36	37·0	1,000
	120	·36	37·2	1,200
	120	·36	31·3	1,600*

* Test stopped. Lamp still burning.

32-c.p. Osram No. 2.	119	·36	37·7	0
	121·5	·375	43	400
	120	·37	36·3	800
	120	·37	37·2	1,200†

† Lamp burnt out after 1,400 hours.

50-c.p. Osram No. 1.	118·5	·475	44·4	0
	119	·49	52	226
	120·5	·49	49·4	400
	120	·49	49·2	600
	120	·48	51·8	800
	120	·49	53·4	1,000
	120	·48	50	1,200
	120	·48	43·7	1,600‡

‡ Test stopped. Lamp still burning.

50-c.p. Osram No. 2.	118·5	·475	38·6	0
	121	·49	50·3	400
	120	·48	49·5	800
	120	·48	45·8	1,200
	120	·48	41·8	1,600§

§ Test stopped. Lamp still burning.

It will be seen that the candle-power increases for the first 300 or 400 hours, and it then falls off slightly, reaching its initial value once more after some 1,200 hours. It is curious to note that the 32-c.p. lamps start with almost the same c.p. as the 50-c.p. lamps, and that the latter, even at their maximum, do not exceed the nominal c.p. by nearly as great a percentage as is the case with the 32-c.p. lamps.

The following figures show that none of the other makes of metal-filament lamps gave nearly such good results as the Osram lamps. Test on two "Just"-Wolfram 120-volt 40-c.p. lamps, made by the Bayerische Glühfadenfabrik, resulted as follows :—

No. 1.—At the start: 118 volts, ·375 amp., 36·8 Hefner c.p.—Burnt out after from 72 to 84 hours.
No. 2.—At the start: 119 volts, ·4 amp., 44·4 Hefner c.p.—Burnt out after 100 hours.

The next lamps tested were three "Sirius-Kolloid" lamps made by the Glühlampenfabrik Gebrüder Pintsch, for 125 volts, 25 c.p. All these burnt out in from 130 to 168 hours, but showed a small current consumption and a very marked increase in candle-power after 100 hours' use :—

No. 1.—121	volts,	·25	amp.,	23	Hefner c.p.—At start.
,, 120·5	,,	·29	,,	39·2	,, After 100 hours.
No. 2.—121	,,	·2	,,	22·4	,, At start.
,, 121	,,	·2	,,	28	,, After 100 hours.
No. 3.—121	,,	·2	,,	22·1	,, At start.
,, 121	,,	·2	,,	28·6	,, After 100 hours.

Finally, three Zircon lamps for 120 volts, 38 c.p., were tested. These were supposed to burn in any position, but, as is shown in the test of the third lamp, the life is very short when burning horizontally :—

No. 1.—120·5 volts, ·4 amp., 46·8 Hefner c.p. At start.—Burning vertically downwards.
,, 121 volts, ·4 amp., 51 Hefner c.p. After 100 hours.—Burning vertically downwards.
No. 2.—120 volts, ·38 amp., 37·7 Hefner c.p. At start.—Burning vertically upwards for above 100 hours.
No. 3.—120 volts, ·435 amp., 32·1 Hefner c.p. At start.—Burning horizontally. Burnt out in 15 hours.

POWER SUPPLY IN LAUNDRIES.

[COMMUNICATED.]

Some general notes on the above question may be of interest to station engineers who find a difficulty in arriving at fair competitive figures in the case of laundries already driven or proposed to be driven by steam power supplied from existing boiler plant necessary for the general purposes of laundry work.

At the outset it must be realised that the necessity for a steam supply is a very real advantage in favour of the steam drive; but, even so, a reasonable competitive price can, more often than not, be arrived at with mutual advantage to both parties. This point is so often overlooked, or not appreciated, that the only claim put forward on behalf of the electrical drive is that of labour-saving.

To take a case in point. A well-known technical journal, in an article advocating electrical drive for laundry work, gave as the argumentative nucleus the following tables of comparative costs :—

TABLE I.—With Steam Engine.

	Per month.
Coal	£12 0 0
Labour	12 10 0
Water	3 10 0
	£28 0 0

TABLE II.—With Electric Motors.

Coal	£5 0 0
Labour	2 15 0
Water	2 5 0
Electricity	9 0 0
	£19 0 0

A brief scrutiny shows that "Steam and power costs" in Table I are made up of two items—coal and water, totalling £15 10s., while in Table II the steam and power costs (coal, water and electrical energy) now total £16 5s. Here we have electrical power openly admitted to be more costly than steam, the only saving being shown against labour.

Now it is surely clear that where boilers are installed a stoker is necessary, and in the case of laundries where the steam used for power is but a small percentage of that used for general purposes, the same stoker in nearly every case will have to act the part of either engine-driver or motor attendant.

Granting that a steam engine requires more attention than its equivalent in motors, it is none the less clear that in either case the stoker will be called upon for this attention, and no saving in labour costs can reasonably be expected.

In a large laundry where the stoker has his time fully occupied as a stoker, the writer is of opinion that a general attendant is a necessity for any form of power drive, and here again no labour saving can be shown.

The question, therefore, presents itself for decision under two heads—capital costs and running costs (including maintenance and depreciation). Remembering that the boiler plant is already existent, the first may be regarded as the relative costs per h.p. for one steam engine with the necessary shafting, as against the costs per h.p. for the equivalent h.p. in individual motors. Here we have an undoubted advantage in favour of electrical power, which in many cases will be of sufficient weight to counterbalance a slight increase in running costs; although, being a capital charge, this advantage must not be relied upon too far.

Turning to the running costs, a slight advantage can again be ascribed to electrical power under depreciation and maintenance, and may reasonably be estimated at 2½ per cent. of the total power costs in favour of the same; but the point of greatest importance is undoubtedly the running costs proper.

A series of tests made by the writer in a laundry equipped with steam and electrical drive gave the following results:

Coke Costs (three separate weeks' running on each).

Steam drive.	*Electrical drive.*
£5 1 0	£4 5 9
5 4 2	4 4 6
5 10 3	4 5 9
£15 15 5	£12 16 0
Balance applicable to electrical energy ...	2 19 5
£15 15 5	£15 15 5

B.T.U.'s consumed (three weeks) 729
729 units at 59s. 5d. ... ... ·97d. per unit.
Coke priced at 24s. 6d. per ton.
Average H.P., 7; maximum H.P., 11·5.

The equipment of the laundry was as follows :—

1 Washer, 250 pieces.
1 Washer, 80 pieces.
1 Collar starcher, 500 collars.
1 26-in. hydro. (overdriven).
1 do. (underdriven).
92-in. Decundun.
108-in. Crabtree ironer.
1 Box mangle.
1 Collar machine.
1 Blower.
1 Neckband machine.
1 Goffering machine.

Engine.—10-H.P. nominal Davey-Paxman locomotive type, non-condensing.
Motors.—One 10-H.P. and one 5-H.P.

The price for fuel is in this case extremely high, but a fair average figure would be, say, 17s. 6d. This would reduce the competitive price from ·97d. per unit, to, say, ·7d. per unit.

In the laundry in question the motor drove through the same countershafting as the engine—a point distinctly in favour of the same, while the absence of all steam-piping (so often an unavoidable feature of steam power in laundries) is again in its favour. Where long runs of steam-piping are rendered necessary (as is often the case), the position is rendered stronger, and under exceptional circumstances 1·5d. to 1·75d. would represent a fair competitive figure.

In spite of the obvious disadvantages in the case given, and assuming a reasonable price for fuel, we are only reduced to the not unremunerative figure of ·7d. per unit; but, weighing up the general question from the figures here given, there is no doubt that with energy at ·75d. to 1d. per unit a very strong competitive scheme lies in the hands of the electrical engineer; and, taking into account the steady nature of the day load to be obtained, this figure cannot be ignored as unremunerative. In many cases, where long runs of steam-piping may be necessary, with their attendant losses, a higher competitive figure would hold good, but each case must be treated on its individual merits. Sufficient has been said to show that under normal conditions the steam laundry presents itself as a remunerative investment for the energies of the power canvasser, to whom it is hoped the figures here given may be of assistance.

NOTES ON SOME LIGHTNING DISCHARGES.

By F. FERNIE.

Damage by lightning on underground and overhead distribution systems is not common in Great Britain, but several instances have come under the writer's notice. One case happened in mid-winter. It was a very wet morning with a south-west wind. The barometer dropped two-tenths in three hours, and at about a quarter to one, the sky suddenly became exceedingly dark and threatening, and the wind changed to N.W. by W. At five minutes to one (P.M.) there was a vivid flash of lightning, followed immediately by a very heavy peal of thunder. A very violent series of squalls ensued, which upset a cab, and in which it was nearly impossible to walk, several ladies being blown down. Five minutes after the first flash, a second flash of lightning took place, but the report of the thunder was heard some time later.

The storm cleared away almost as suddenly as it had arrived. Many telephone wires were fused, and people using their instruments were stated to have received shocks. The fire alarm indicators in the fire station all dropped, and telephone bells rang all over the town. The electric light consumers were affected chiefly in one district, and in about the centre of this district a lightning conductor on a church was supposed to have carried a considerable charge to earth. The feeders supplying this district are partly bare copper strip supported on insulators in a culvert.

A number of consumers' main and sub-fuses were melted at the time of the first discharge. Most of them had lights on at the time owing to the darkness. A flash was supposed to have been seen in the generating station, round the resistance connecting the third wire to earth. The lighting system is a three-wire one, with earthed third wire at the station. Several plate glass windows in the district were smashed.

The fuses melted were, in every case, those on the outer mains. About half were positive and half negative, and in two or three cases where three wires were led into a building both fuses on the outer mains were gone. The church with the lightning conductor was fairly in the centre of the affected area. The conductor was torn down, some rafters were damaged, and some lead sheeting on the roof was blistered. In the church both lighting main fuses, and between 20 and 30 sub-fuses, were melted. The insulation resistance, after the fuses were replaced, amounted to some meghoms.

It is curious that in those places near the centre of the district where fuses were melted, the insulation resistance, tested afterwards, was quite good, amounting to 10 or 15 megohms in some places. On the other hand, the three or four places, where fuses were melted on the outskirts of the district, were found afterwards to have "earths" on their circuits. No lamps appear to have been broken; one consumer reported that all lamps went out, but lit up again. Perhaps a bad contact accounted for this.

The following was suggested as a possible explanation. The charge on the cloud induced a heavy charge on the earth immediately beneath it. This charge on the earth, in turn, induced a charge on the electric lighting conductors, which would thus be of the same sign as that of the cloud, and opposite to that of the earth.

Both these induced charges were "bound," until the cloud discharged to earth through the lightning conductor. Immediately this happened the charge on the conductors became "free" and started to expand in every direction, as a surging current, following every branch of the network, and charging every wire connected to it. Those buildings near the beginning of the surge, which had most lights on at the time, would be most affected, because they had the biggest capacity of wire connected.

As the wave travelled further away from its starting point, it would get less and less, and on a very large network gradually die away. Places having earths on the circuit, somewhat away from the centre of the disturbance, would attract more current than those whose insulation was sound. Perhaps there was a very heavy charge on the wires, but at a comparatively low potential. A very high potential difference from earth must have punctured the insulation in many consumers' premises.

It is, of course, possible that this did really happen, and that the insulation sealed itself up again after the discharge passed. That no third wire fuses were melted, may be because the earth connection immediately relieved the pressure on the third wire.

That high potentials did arise in places, is shown by the fact that at the end of a branch feeder which happened to be disconnected from the network, the current jumped across 2 in. of paper insulation covered by wax and a rubber sleeve, on to the lead sheathing of the cable. The current wave coming to a dead end would be deflected back, and the deflected waves superposed on each other would "pile up" to a high potential. Nearly all the mains composing this network are single cables.

Another case reported to the writer occurred during a heavy thunderstorm and pelting rain. A house near the street was struck, and the masonry considerably damaged; the discharge appeared to branch off from the house, to pass along a stone wall bounding the street, to leave the wall by the branch of a tree overhanging the footpath (the branch was completely withered), and to jump from the tree to or through a manhole cover on a feeder culvert, and hence on

to the bare copper strip third wire, which was supported on insulators and earthed at the generating station. The inside of the manhole cover (a cast-iron frame filled up with concrete) was covered with beads of copper. The copper strip itself was completely and cleanly severed, the ends appearing to consist of carbon, entirely different from any fused ends caused by ordinary short-circuits. A jointer working on the third wire of the same network some 2 miles away received a severe shock.

Other things that happened are difficult to disentangle, owing to the copper strip buckling up in all directions and getting across the two outer strips. This would appear to have been a direct discharge from a clond, *via* the copper strip to earth. The top of the wall was very wet, but the foundation was dry. The branch of the tree was about 5 ft. above the manhole cover.

Another case, coming directly under the writer's notice, occurred on an overhead traction system. A car during a thunderstorm, and about 1½ miles from the generating station, had its trolley pole violently knocked off the trolley wire, and, at the same time, in the generating station the single multipolar continuous-current machine that was running appeared to have a ring of vivid blue flame around its commutator. The whole engine room was lit up with a blue light, which probably came from the lightning arrester behind the switchboard, which was completely destroyed. This arrester was of the horn type. The ring of flame round the commutator lasted quite a perceptible time—perhaps half a minute. The writer thinks this was caused by an induced charge on the trolley wire. Perhaps the machine current followed the discharge over the arrester.

In a letter to the ELECTRICAL REVIEW some months ago, Mr. A. H. Shaw gave an account of a lightning discharge at Ilford. This is a three-wire system with earthed neutral, the mains being laid solid. During a heavy thunderstorm, two adjoining houses were struck, and in addition to pipes and taps being damaged, the electrical fittings were torn down. At the same time a bad fault developed on the mains, and it was found that near the two houses struck, house service boxes were burnt out and a length of distributor was destroyed. Another fault occurred on the mains 1,200 yd. away, and at two other places, distant 900 and 1,000 yd. respectively, the fittings were fused and torn down. None of these fittings were switched on at the time. The main fuses were destroyed in only one case. This would appear to have been caused by a direct discharge.

Another case reported in the ELECTRICAL REVIEW was of one fuse on a three-wire service being melted, a neighbouring grocer having a large stock of matches set on fire at the same time. Another consumer had both main fuses (outers) melted on the same network.

COAL-CUTTING MACHINERY.

BY ALLAN R. CONNAL, A.M.I.E.E.

ONLY within the last half century has any serious attempt has been made towards the increase of the world's coal output by the utilisation of mechanical "Colliers," and nearly three decades of that period passed before electricity was pressed into the service.

In the year 1889 an electrically-driven coal-cutter was exhibited at the Paris Exposition, by an American company, and was awarded a gold medal. This machine was of the "Pick" type, and, although it aroused considerable attention at the time, it probably served very little purpose beyond giving a hint to engineers and colliery managers as to the lines on which experiments in this class of machinery should proceed.

During the next ten years the efforts of inventors in this country, in the field of compressed air and electricity alike, met with varying fortunes, most of the time being spent in costly experiments; the majority of the machines then in use were regarded by the miners as highly dangerous to life, unsatisfactory to handle, and likely to prove serious rivals and an important factor in the general reduction of prices obtainable for "hand-holing."

America really led the way in the design and manufacture of coal-cutters, and the nature of her coalfields rendered it possible to successfully operate a very much simpler and less expensive machine than the severe conditions to be met in this country would permit of. Many American collieries are "drifts," and the seams are not—except in very rare instances—nearly so faulty as in Great Britain.

The result of American enterprise, coupled with many natural advantages of the country, soon made it apparent that "machine-holing" had come to stay in the States, and in the year 1900, when Great Britain could only boast of about 300 coal-cutters all told, more than 10 times that number were in use in America.

In 1898 a "Hurd" bar machine cut 75 ft. in an hour, with an under-cut of 42 in., and a few months later an American chain cutter successfully negotiated 80 ft. in one hour, under-cutting 46 in. The conditions were certainly not quite the same, and the quality of the material to be cut varied considerably, but both machines were electrically-driven.

Seven years ago the proportion of machines driven by compressed air to those operated by electricity was as 4·6 to 1, but during recent years the electric coal-cutter has been gradually drawing abreast of its rival, and, at the time of writing, the figures are more like 1·5 to 1 for this country, although in no class of coal-cutter have we yet approached the results obtained by our cousins.

There are at present over 5,000 coal-cutting machines in use in the United States, against about 1,200 only over here—figures which do not bear any relation to the output of coal from the two countries—and it has been suggested that there is some important reason for the poor progress of the machine in Great Britain.

We do not know much of the American colliery-owner and his methods, beyond the fact that in quite a number of mines the cost per ton of coal delivered at the pit-mouth is very much lower than some of our largest collieries are paying; but we do know something of the British coal-owner. We know, amongst other things, that, as a class, he is very conservative, that the plant in use at quite important collieries is the same that his father, and perhaps his grandfather, used before him, and that only minor repairs are sanctioned until a really serious breakdown occurs. On the other hand, coal-cutting plant is costly and shareholders are hard to please, while the regulations applying to mines are stringent and expensive to comply with, and will not be made less expensive if the Eight-hour Bill becomes law.

Another, and perhaps the most important, factor in the case, is the attitude of the miners, and, as the reputation of a cutter often lies in the hands of the men, and it has no other advocate to plead its cause if condemned by the operator, the hostility shown by a very large section of the miners is a force to be seriously reckoned with. This is common ground for all manufacturers of coal-cutting machinery, for no real advance can be made until the miners are taught to look upon the coal-cutter as an auxiliary and ally rather than a rival: as the working partner doing the arduous work of "holing," and leaving the human miner free to deal with the coal after the fall, instead of as a dangerous and industrious competitor, destined to "oust" the man from his job.

That the cutter can have any permanent effect on wages is an absurd contention; the only difference can be in the output, which would, of course, go up, thus providing work for many more men on the top, and in the screening plant, than it could ever displace below.

Electric coal-cutters, despite their bulk, are very delicate pieces of machinery, and even with fair treatment they require pampering a little; but stow them away a few hundred yards below ground, with attendants who do not understand them, do not want to, and are already prejudiced against them, and you would be more than human if you expected favourable results.

Compressed air is a very useful power for coal-cutters, and there is the advantage that the exhaust helps the ventilation

to some extent, but the efficiency is very low, and if pipes are not of ample size, a drop in pressure results, all the machines in the pit are affected, and the output cannot be maintained. Electrical machines are slightly more complicated, are more expensive to install, and may be more costly in up-keep, but the efficiency soon repays the extra cost, and the running costs also show up very advantageously.

It is sometimes argued that many British mines are so small that they cannot successfully work more than one or two cutters, and that for such a mine the outlay of £900 or £1,000 per machine, including generating machinery, would be prohibitive, at least to all but the wealthiest collieries, whose proprietors insist upon being up-to-date at any cost. There is, of course, a certain amount of truth in that argument, but there are mechanical coal-cutters manufactured in this country which are small enough for any mine in which there is a reasonable possibility of reducing costs by their use.

A number of accidents have occurred in recent years—some of them, unfortunately, fatal—which have been directly due to the use of coal-cutters, and in this respect the electrically-driven machine has been proved to be the principal offender; but happily these accidents are becoming more rare in proportion to the number of machines in use, and where they do occur it is usually found that the wilful neglect or ignorance of the operator has been a strong contributory cause.

Coal-cutting machinery is being made with much greater care now than ever before, and the necessity for good insulating material is thoroughly realised by the best makers.

There are at present on the British market about a dozen different types of coal-cutting machines, manufactured in this country, in addition to three of American make; our coalfields are of such a varied nature that nearly every type of machine is found to be working satisfactorily in at least one pit, and many of them are suitable for quite a range of seams.

In the writer's opinion, the cutter of the future is the "Chain" type, reversible, with gas-tight motor and tilting cutter arm, which will allow of cutting above or below pyrites or other impurities; but there is undoubtedly still a large field for the "Disk" type—which is somewhat more economical—and, to a lesser degree, for the "Bar" machine.

The main purpose of this article is to induce manufacturers to look into the whole question of coal-cutting plant, and to ask themselves the question, "Is my electric coal-cutter in such a state of perfection that I can confidently recommend it as my leading line?"

It is thought by many that the next few years will see a mild "boom" in mechanical coal-cutters, especially if the new Bill passes and the Labour party attempt to introduce legislation to further handicap the colliery-owners.

Coal-cutters are not turned out quickly or in large quantities, and it behoves the manufacturer to have his house in order.

The Proposed Electricity Tax in Germany.—The scheme for the imposition of a tax on electricity, to which reference has previously been made in this journal, has already aroused a large amount of opposition in that country, although the exact proposals of the Government have not yet been announced. It is, however, understood that the tax will apply both to the use of electric light and power, and to gas for lighting purposes. One statement is to the effect that the tax will amount to a ¼d. per cubic metre of illuminating gas and to §d. per kilowatt-hour for electrical energy, these implying the levying of an impost ranging from 10 to 15 per cent. according to the present prices charged. It is calculated on this basis that the taxes would yield an annual revenue of from £1,750,000 to £2,000,000. Negotiations on the subject are proceeding between the Governments of the various States, and on their completion the Federal Council will announce what is actually proposed. In the meantime Bavaria and Baden, which contemplate the utilisation of water power in connection with the working of projected electric railways, appear to be opposed to the scheme, and local authorities in other States are protesting against the imposition of a tax which would diminish their annual income from the ownership of electric supply works, and which would, it is contended, place obstacles in the way of industrial development.

ELECTRICAL CASES OF THE LEGAL YEAR.

[FROM OUR LEGAL CONTRIBUTOR.]

Now that the Courts are up for the long vacation, the columns of this Journal which are usually devoted to the reports of cases will stand empty for a time; at any rate, we shall have no more decisions of the High Court to record until October.

In these circumstances it may be interesting to review and summarise a few of the more important cases which have been noted by us during the last 12 months.

Railway companies which are injured by the competition of tramway companies are not always disposed to facilitate the erection of overhead trolley-wires. In one case (Rhondda Tramways Co. *v.* Taff Vale Railway Co., 24 T.L.R. 213) the railway company sought to prevent the tramway company from entering upon their land to alter certain telegraph wires. It was held, however, by the Court of Appeal, that Sec. 30 of the Tramways Act, 1870, enables a tramway company, which works its tramways by electrical power on the overhead trolley system, to enter upon the land of a railway company where the tramway crosses the railway line by a bridge, and alter the position of the railway company's telegraph wires so as to enable the tramway company to comply with the Board of Trade regulations, made under the special Act, that the tramway wire must be 21 ft. above the surface of the road, and must have a protecting wire 2 ft. above the power wire where the tramway crosses the railway bridge.

Cases of nuisance caused by the generation of electricity have not been frequent during the past session. In the one reported case, the plaintiffs' efforts were not attended with success. The works in question were in Brighton. In an action by the incumbent and trustees of a church for an injunction to restrain the Corporation from so using the machinery in their electrical generating and transforming station, which was erected close to the plaintiffs' church, as to cause nuisance and annoyance to the plaintiffs and to those using the church and the school buildings adjoining, the Court came to the conclusion upon the evidence that the plaintiffs had not made out that a sufficient serious annoyance had been caused so as to amount to a nuisance, and refused an injunction. (Heath *v.* Mayor, &c., of Brighton, Joyce, J., 24 T.L.R. 414.)

Perhaps the most important case of the legal year was that of Bourne *v.* Mayor of Marylebone (24 T.L.R. 613), where the force and validity of a contract between a consumer and a supply authority were considered.

By virtue of a provisional order duly confirmed by statute, the defendant Corporation were constituted the electric light authority for Marylebone, and were empowered to provide, sell, let for hire, alter, repair, &c., fittings for lighting and motive power, and were also authorised to enter into and carry into effect contracts for such purposes. If they made default in supplying energy to any owner or occupier of premises to whom they might be or were required to supply energy, they were to be liable to a penalty for each day on which any such default occurred. By a contract, partly verbal and partly in writing, made between the plaintiffs and the defendants, the latter agreed to supply the plaintiffs' premises with electric light at a voltage of 240 by the first week of September, 1905, and, on breach of that contract by the defendants, they agreed to supply the plaintiffs with electric light at a voltage of 200 within two days of September 19th. Relying on the defendants carrying out their contract to supply the 240-volt current by the first week in September, the plaintiffs made an installation suitable for that current; and on breach by the defendants of the first contract, the plaintiffs, at the defendants' request, altered the installation to make it suitable for a voltage of 200, but the current was not supplied till October 3rd, whereby the plaintiffs suffered damage. In an action for breach of contract, the jury found that it was necessary that contracts such as had been entered into with the plaintiffs should be made to carry into effect the purposes of the defendants as suppliers of electric light. Mr. Justice Ridley held:—(1) That the contracts were binding on the defendants, although not made under seal; (2) that they were not *ultra vires* of the defendants; and (3) that as the

action was founded on a breach of contract and not on a breach of a statutory obligation, the defendants were liable in damages and not to the statutory penalty; but the Court of Appeal revising this decision, held that there was no evidence to go to the jury of any contract by the defendant Corporation with the plaintiffs as to the supply at a particular date of electric light to the plaintiffs' premises, nor any evidence of any authority in the officers of the Corporation to make any such contract.

The eternal question whether a street box is a "structure," and as such liable to inspection under the London Building Act, has also been considered.

The appellants, who supplied electric light and power to a London district under statutory powers, constructed beneath the footway of a public street a chamber through which the conduit pipes containing their electric cables passed. The chamber was square in shape, and had a concrete foundation or floor with brick walls, and had an iron and concrete lid. The chamber was used for repairing and renewing the cables, and measured internally 27 in. in length and width and 30 in. in depth from the level of the surface of the footway. The appellants before constructing the chamber served notices, as required by their special Act, on the Postmaster-General, the local authority, and the London County Council. Upon a summons charging the appellants with having begun the work before serving a notice on the district surveyor, as required by Sec. 145 of the London Building Act, 1894, the magistrate convicted them. He held that the chamber was a "structure" within the meaning of Sec. 145, and that the notice required by that section ought to have been served, notwithstanding that notices were also required by the special Act to be served on the local authority and the County Council. (County of London Electric Supply Co. *v.* Perkins, 24 T.L.R. 327.)

In the domain of rating law, there have been no decisions in connection with the rating of a generating station. But there is an important case which lays it down that the proprietors of a light railway are in a much more favourable condition on the question of rating than are the proprietors of an electric tramway. The House of Lords has decided that a light railway, which is authorised by an order under the Light Railways Act, 1896, to be laid in the public streets, and which is not distinguishable in other respects from an ordinary electric tramway, is assessable to the general district rate as land "used only as a railway constructed under the powers of any Act of Parliament for public conveyance" within the meaning of Sec. 211, Sub-Sec. 1 (*b*) of the Public Health Act, 1875, in the proportion of one-fourth part only of the net annual value thereof. "Used only as a railway" refers to a user by the occupier who is to be rated. (Wakefield Corporation *v.* Wakefield and District Light Railways Co., 24 T.L.R. 603.)

Certain important provisions of the Telegraph Act, 1863, have also come before the Court for consideration. A telephone company, under a licence from the Postmaster-General, which gave them the right to do certain works "other than works under, in, upon, over, along, or across any railway or canal," carried a telephone cable, with the consent of a railway company and upon payment to them of £30 a year, under the surface of the footpath of the road of a bridge which crossed over the railway. The road was vested in and repairable by the local authority. The telephone company subsequently repudiated the agreement upon the ground that the consent of the railway company was not required. It was held that the cable was carried "over or across" the railway, and that the telephone company were not entitled so to carry it without the consent of the railway company and upon payment of £30 a year. (South-Eastern Railway Co. and South-Eastern and Chatham Railway Companies' Managing Committee *v.* National Telephone Co., 24 T.L.R. 579.)

In another case the Court of Appeal laid down certain principles of great importance to owners of private telephones. It was decided by the Court of Appeal that a telephone which connects two businesses belonging to different persons, and which is owned by one of them, and is maintained for his private use, though he may permit it to be used for the transmission by others of messages, provided that no charge is made for the transmission, collection, receipt, or delivery thereof, comes within the exemption in Sec. 5 of the Telegraph Act, 1869, from the monopoly of the Postmaster-General. Wires which connected boxes placed in the public streets with fire stations belonging to the local authority, so as to enable fire alarms to be given by ringing an electric bell, but to which no telephone was attached, were held to be within the exemption in Sec. 5. (His Majesty's Postmaster-General *v.* National Telephone Co., 24 T.L.R. 665.)

One other case relating to telegraphs remains to be noticed, though it approaches the subject from a different point of view.

In Curtice *v.* London City and Midland Bank (24 T.L.R. 176), a question arose as to whether a bank is bound to accept and act upon a telegram sent to countermand a cheque. In the case in question, a man who had given a cheque sent a wire to his bankers to stop payment. The wire arrived after banking hours, and was placed in the letter box where it remained until the following morning. When clearing the letter box a clerk left the telegram behind by mistake, with the result that the cheque was honoured. The customer sued the bank for the amount. It was held that the bank was not liable; for although a banker may reasonably and in the ordinary course act on a telegram, he is not bound in law to accept an unauthenticated telegram as sufficient authority for refusing to pay a cheque.

Of cases which do not directly relate to electricity, those which concern the law of master and servant are possibly of the greatest interest to our readers. Workmen's compensation cases are sufficiently well reported in the papers to need no special mention in this place; but there are others relating to wrongful dismissal which merit a few words of attention.

We have often commented upon what is known as the "restrictive covenant" in contracts of service. By the insertion of such a covenant, an employer can prevent a man who leaves his service from setting up in opposition. But supposing the servant is wrongfully dismissed? Does the employé lose his rights? This point was considered in the case of General Bill Posting Co. *v.* Atkinson (24 T.L.R. 285). The defendant was employed by the plaintiff company as their manager and secretary, under an agreement which provided that he should hold office subject to termination at 12 months' notice in writing given by either party, and that he should not, whilst in the engagement or within two years after his engagement with the company terminated, commence the same or a similar business or accept a situation as manager or assistant to any person or company in a similar business to the plaintiff company within a radius of 50 miles from the registered office of the company unless he received written permission to do so. The defendant was dismissed without notice, and brought an action for wrongful dismissal in which he recovered judgment. Within two years after his dismissal, he commenced to carry on a business similar to that of the plaintiffs within the prescribed distance of 50 miles. The plaintiffs then brought an action against the defendant upon the stipulation in the agreement not to carry on a similar business. It was held, that as the plaintiffs, by wrongfully dismissing the defendant, had repudiated the contract of employment, and that repudiation had been accepted by the defendant, the contract was completely determined, and the plaintiffs could not sue upon the stipulation in the contract.

One of the grounds on which a restrictive covenant may be attacked is that it is unreasonable. Another case shows what meaning the Courts will attach to this word. A clerk to a firm of solicitors covenanted that, if his engagement should be terminated, he would not "act for any person who is, or has within the previous five years been, a client of the firm." It was held, that the covenant referred to persons who should be clients of the firm at the time when the clerk's engagement terminated, or within five years before that time, and that it was not wider than was reasonably necessary for the protection of the firm's practice (Lewis & Lewis *v.* Durnford, 24 T.L.R. 64).

The possibility of a man falling ill is a matter seldom taken into account when an agreement of service is drawn up. The following case serves as an illustration of the way in which an employer may be affected in case of illness. By an agreement made in August, 1903, the defendants agreed to employ the plaintiff for a period of five years as their works manager. The agreement contained no provision

enabling the defendants to terminate the agreement before the end of the five years. Towards the end of 1905 the plaintiff became ill, and was absent from work from time to time. In January, 1906, his illness became more serious, and shortly afterwards he was medically examined, and was told that he must have complete rest for a considerable time and undergo special treatment. It did not appear from the certificate of the doctor given at the time that the plaintiff would never be able to resume his work. As, by reason of his ill-health, the plaintiff continued to be absent from work, the defendants gave him notice in April, 1906, terminating the agreement, and they appointed one of their staff to act as works manager. By the middle of May, 1906, the plaintiff recovered and was fit for work. In an action by him for damages for breach of contract, J. Channell held that he was entitled to recover, inasmuch as the circumstances were not such as to justify the defendants in thinking that the plaintiff would never be able to perform a substantial part of the unexpired period of the agreement. It was held that, as the learned Judge had applied the true test—namely, whether the illness was such as to put an end in a business sense to the engagement and to frustrate the object of the engagement—and having found as a fact that it did not, the Court would not interfere. (Storey *v.* Fulham Steel Works Co., 24 T.L.R. 89.)

In the case of a discharged traveller, it is sometimes necessary for an employer to warn his customers that the person discharged is no longer employed by him. This is quite legitimate. In Beswick *v.* Smith (24 T.L.R. 169), the plaintiff was employed as commercial traveller by the defendant, and the defendant signed and circulated among his customers cards in unfastened envelopes with these words upon them :—" H. Beswick is no longer in our employ. Please give him no order or pay him any money on our account." In an action for libel the jury found that the words were libellous, and that the defendant acted maliciously in circulating them. It was held that the words were not capable of a defamatory meaning, and that the defendant was entitled to judgment.

TRAFFIC EXPEDIENTS AT BROOKLYN BRIDGE.

By DUDLEY W. WALTON, New York.

The diagram shows the plan of the three-decked terminus at the New York end of Brooklyn Bridge, where some highly interesting electrical and engineering developments have taken place over a series of years, with a view of meeting the constantly increasing traffic, which severely taxes the capacity of the bridge. The two sets of loops shown on the plan accommodate the electric trolley cars on the street level. Above these are ticket offices and gangways not shown on the drawing. The elevated interlacing tracks, with the loading and unloading platforms, are on the uppermost story, various old and new connecting stairways being indicated. The platforms now extend several yards farther across Park Row, but their exact ends, as well as additional stairways, are not shown. At the other end of the plan is seen the beginning of the bridge approach, with its two outer carriage ways, the electric street car lines, the elevated electric and cable train tracks, with the passenger promenade between. All the incoming traffic comes along the northerly roads, and the outgoing traffic passes to the south.

The existing car lines were originally designed for horse traction, but were converted into an overhead electrical trolley system, which at the New York end passed at first around the four loops nearest to Park Row; the other four loops are of recent date. The eight loops together are quite insufficient to meet the heavier traffic, for at present as many as 4,700 trolley cars cross the bridge every 24 hours. The average daily number of trolley cars between 5 and 6 p.m. has been increased from 236 to 310 since May, 1907.

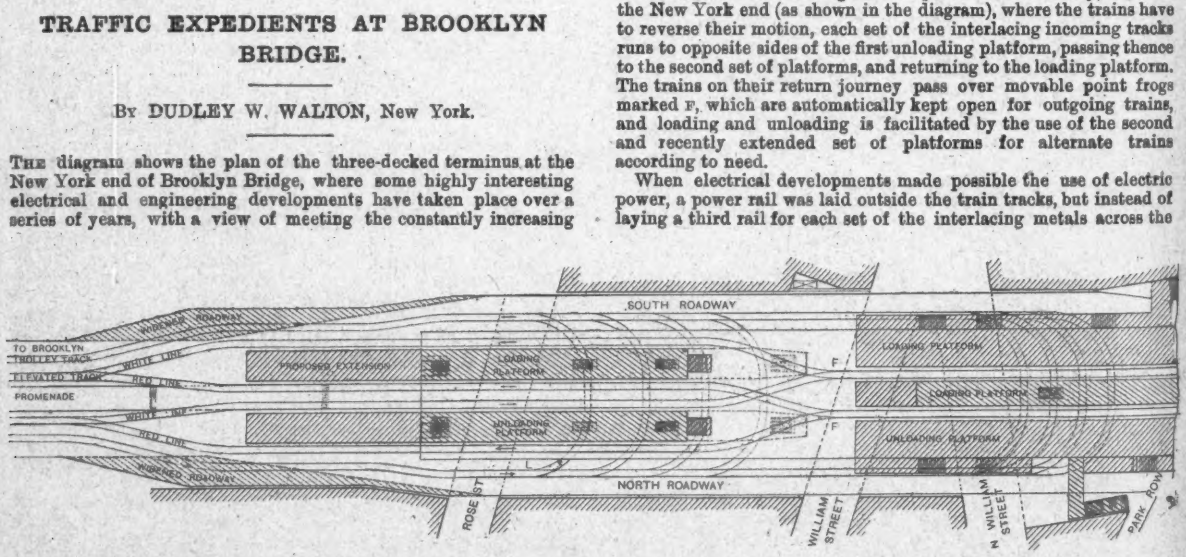
The incoming trolley cars pass over movable points to reach their respective loops, the points being operated by hand; but the trolley poles do not require attention when rounding a loop, because at about the point L, where the first loop is encountered, the overhead wire conductor ceases, merging into an overhead construction consisting of metal plates, about 20 in. wide, properly insulated, and guarded on their under edges, and the trolley head picks up the current by contact with these inverted channels. The channels over each loop merge into the main channel, and are sufficiently wide at the junctions to ensure that the pole will take the same direction as the car, as it follows the car around the bend. Similarly on the outgoing track at about the position indicated by the arrow, the overhead conducting channel narrows to a point, and throws the trolley on to the wire again. There is a supplementary overhead power wire across the bridge which is used if the power gives out on the ordinary conductor. There are no overhead movable points on any of the New York or Brooklyn lines, junctions and crossings being negotiated by means of overhead plate conductors; or the trolley pole is pulled down while turning a corner.

Combined Electric and Cable Traction.

With regard to the elevated traffic, the trains were originally propelled by small steam locomotives, but the heavier traffic on the bridge was handled by cable cars. A single cable, hauled by machinery at the Brooklyn end, and reversing its motion over a wheel at the New York end, took care of the trains in both directions, the trains usually consisting of five cars each. It was soon found that the single cable was not powerful enough for the "rush-hour" traffic, and a second cable was put down, parallel with and a few inches from the first. But as the additional cable did not align with the longitudinal axis of the train, supplementary interlacing track rails were laid down on the same sleepers, and alternate trains now run on the different tracks, being hauled by one or the other cable, so that each cable takes care of half the total load. The lines are named "white" and "red" respectively, from the colour of the car lights. These interlacing tracks are seen diverging from each other at the left of the diagram, and these pairs of double tracks, with their duplicated cables, run right across the bridge for about a mile to the Brooklyn station. This method nearly doubled the passenger capacity of the cable line, but in turn led to difficulties in operating the necessary movable-point switches diverging to the platforms. An ingenious expedient surmounted this difficulty, each set of tracks being laid so that the points at the Brooklyn end were abolished, each line serving its own platform exclusively, while at the New York end (as shown in the diagram), where the trains have to reverse their motion, each set of the interlacing incoming tracks runs to opposite sides of the first unloading platform, passing thence to the second set of platforms, and returning to the loading platform. The trains on their return journey pass over movable point frogs marked F, which are automatically kept open for outgoing trains, and loading and unloading is facilitated by the use of the second and recently extended set of platforms for alternate trains according to need.

When electrical developments made possible the use of electric power, a power rail was laid outside the train tracks, but instead of laying a third rail for each set of the interlacing metals across the bridge, it was found that the power rail could be used for both sets of cars by laying the rail upside down, its broad base being sufficiently wide to make a good electrical contact with the shoes of the cars travelling on either track. Thus a "white" train picks up current from the inner edge, and a "red" train picks up current from the outer edge of the same rail. Return currents transverse the tracks, which are suitably bonded, but not insulated from the metal work of the bridge.

Until this year, the cable cars were run during the busy hours, all passengers being transferred to and from electric trains at the Brooklyn end of the bridge, where a new station was built above the old one. It was necessary, however, to start the cable trains by means of electric power, the cables not being led into the stations, but while actually on the bridge they were run during busy times



Plan showing the Arrangement of Street and Elevated Tracks, at the New York Terminus of the Brooklyn Bridge.

by cables only, there being an economy of power due to the steadiness of the maximum load. The cables are not now used except for emergency traffic, all trains using electric power, and proceeding direct to their destinations.

This series of engineering improvements has made it possible to run as many as 60 trains an hour in each direction in a space originally designed for two tracks only. As many as 63 trains per hour have been run, some of the trains having a headway of only 43 secs. This combination of electric and cable power worked very well from the mechanical point of view, the cost of maintenance per car-mile being relatively small, and the risk of breakdowns due to the duplicated system being almost nil.

The Philosophy of the Loop.

With the opening of the under-river subways to Brooklyn, in January, it was thought that the traffic on the bridge would decrease, but this has not happened, partly because the complete Brooklyn subway system is not yet opened, and partly because people avoid the subways in warm weather. The entire traffic problem of the bridge arises from the fact that it is a *terminus*, forcing thousands of passengers to change cars for various "up" and "down" town destinations. With the coming completion of the Manhattan "eye-bar" cable bridge, costly work is to be undertaken in order to run a large proportion of the electric trains arriving at New York into a subway, thence making loop connections with the Manhattan and Williamsburgh Bridges. All the new traction work in New York will follow the principle of the loop, to avoid the reversing of trains, and the wholesale discharge of passengers.

Pending this work, a massive but temporary platform has been built across Park Row, allowing passengers to sort themselves out on to various platforms according to destination, and the cable service is no longer used, all trains running through to Brooklyn suburbs. The local three-cent bridge service has also been abolished as far as the elevated line is concerned, and all passengers who merely wish to cross the bridge, travel in trolley cars set apart for this purpose, an idea borrowed from the successful service over Williamsburgh Bridge. By this means the express electric train service to distant suburbs is now being improved. The number of cars per train has been increased to six. Altogether 20,000 additional train seats are now available in the morning, and 25,000 in the evening "rush" hour. The available daily average of seats in the trolley cars has been increased by 12,000. As between September, 1907, and March, 1908, there has been a notable reduction in the recorded delays, from 1,060 minutes per month to 385 minutes. Additional trolley tracks are being laid at the Brooklyn end of the bridge and a new terminal building is planned for the New York end, to cost £600,000 or more. This building will sort out the entire bridge traffic on three separate floors, with separate stairways from the ground level to each car or train, and also provide the utmost facilities for transfer to and from the general subway and elevated systems of New York proper.

The company is compelled by its charter to run a service of cars all night. Twice a year either the train service or the trolley service is entirely suspended during five or six nights to enable the track to be repaired. The trolley tracks wear out very quickly, especially on the loops, owing to the enormous traffic. The minimum headway allowed on the bridge for the trolley cars is 100 ft., which in practice allows the running of six or seven cars per minute. Tolls are levied on each trolley car, their journeys being automatically registered in duplicate by electro-mechanical catches fixed on the power wire at the Brooklyn end.

The bridge structure itself is about 24 years old, and in the opinion of competent engineers is practically worn out. Its theoretical factor of safety has been continually encroached upon of late years, and there are times of the day when its overload capacity is fully utilised.

RUBBER INSULATION.*

Preparation of Material.

The preparation of material for insulation of electric wire requires more care than is usually found necessary in other departments of the rubber business. A number of wild gums, gathered in widely separated districts over the earth, some plantation rubber and many patented compounds, form the base of much of the insulation at present used. Standing at the head of the list is "fine Para," the South American rubber, the acknowledged king of all gums. It is, perhaps, open to question whether Para is essential to the best insulation, but its quality is so generally superior to other kinds of rubber that it forms the basis of specifications for producing the best insulation. In its crude form it reaches the great markets of the world in superior condition. It takes the shape of hams or large biscuits, which are solid, relatively clean, and easily handled. Many another grade of rubber, however, comes to market in more or less sticky and excessively dirty masses, from which nothing short of a glittering imagination and untiring industry could produce anything of value to man.

The first step in the civilising of crude rubber is a bath. It is a long bath, in very hot water, which softens the gum and loosens the dirt. It is eventually placed upon the washing machines, where the biscuits are torn apart and crushed between steel rollers and worked through them repeatedly under a stream of hot or cold water until, in place of the black, ill-smelling, evil-looking mass from the tropical forests, there is a large sheet of perfectly clean rubber.

Still more curious, perhaps, are the colours which disclose themselves after the bath and the scrub. The fine Para, if it has been in store for a year or more, will show a dark, smooth grey. If it has been from the sap for only six months, it may be as yellow as old cream or a rich chocolate brown. Plantation rubber may be flesh-coloured; Loporī, from Africa, dark grey flecked with white; Accra, from the Gold Coast of Africa, light grey, and so on. Up to this time, there has been a picturesque side to the rubber picture, but it closes with the introduction of the gum to the dry room or vacuum dryer. There it soon loses all moisture, and incidentally most of its colour. In this dry state it is ready for the second of the great changes through which it must pass before becoming of real use to man. In the factory it is called "breaking down," and consists of working between hot rollers until the primeval strength is modified to the degree that will permit of its being used in manufacturing insulation.

Para rubber is the most intractable of the gums, requiring five or more hours to "break down" properly. Other gums require much less time, from one to three hours being adequate. Sufficient breaking down is absolutely essential to the use of fine Para in that form of insulation that is applied to wire by means of the tubing machine. Here the compounded material containing a certain percentage of rubber must be forced through the confining space of the machine "worm" into its head and out of a relatively small orifice corresponding to the outside diameter of the insulation required. If the compound is not sufficiently soft it will come upon the wire in corrugations in place of a perfectly smooth surface, or it will leave gaps through which the wire can be seen, or it will be so slow in coming from the machine as to become semi-cured and, therefore, unsuitable for a workmanlike result.

Another essential in insulation is absence of moisture. Moisture is the bugbear of the rubber compounder. Many ingredients used in the preparation of insulation have an affinity for water which if not thoroughly dissipated in the dry rooms or upon the mixing mills will probably be brought into evidence during vulcanisation, appearing in the form of blisters, or pits, or sponginess, any one of which will destroy the value of the cover as an insulator.

Any crude rubber that has passed through a vacuum dryer or hung 30 days in a dry room heated to 90° F., should be fine and fit in compounds. But rubber must be more than dry; it must be clean. The best grades contain some dirt and sand; the cheaper grades are loaded with it. The writer saw a portion of a well-known rubber that contained 76½ per cent. of waste material. A mass of sand, bark and dirt had been pressed into the form of a ball and cleverly covered by a thin skin of rubber. This is an extreme case. However, the rubber manufacturer expects a shrinkage loss ranging from 15 to 20 per cent. in fine Para to from 40 to 60 per cent. in the cheaper gums. This is, as a matter of fact, not all dirt, sand, bark, &c., but moisture as well, for which the manufacturer must pay when he buys in the market. The most exacting care, therefore, cannot, with reason, be expected to eliminate all sand from rubber. This is a matter of indifference in manufacture of most mechanical goods, but in insulation one grain of fine sand may destroy the work of hours turned out by a tubing machine. The sand may lodge in the die, that part of the machine from which the insulation material issues as it is applied upon the wire, and which not only controls the size and thickness of the insulation coat, but holds the wire in the centre. The sand particle is likely to do one of two things: throw the insulation out of centre or split it longitudinally. Owing to the high speed with which these machines run on common sizes of wire, many hundreds or thousands of feet may be covered before the imperfection is discovered. The imperfection means loss in time and quantity, as the machine is stopped, the particle of sand removed, and in orders calling for specific lengths of perfect insulation, the entire output is discarded and the wire stripped. Hence it follows that preparation of insulating material in the mill and compounding rooms calls for something more than the careful cleaning and drying of rubber.

All rubber before incorporation in a compound should be "ground." To grind rubber, the mill rolls are set so closely together that the gum is drawn from between them in the form of a thin, semi-transparent sheet. In this operation it is possible to crush large particles of sand or other material, or upon discovery, remove them. This is one of the items of care that pays.

All of the manufacturer's troubles are not attributable to rubber alone, for dirt and moisture are to be found in all of the materials used in conjunction with rubber in the compounding of insulation material. To checkmate this additional cause for anxiety, all compounding materials must be dried and sifted. For large establishments sieves are operated by motors. Of the many different patterns those that revolve are easiest to operate and effective. Their capacity ranges from a half barrel upward, and 200 lb. and over should be cleaned per hour. As a rule, each compounding substance has its own sieve. These sieves are enclosed in steam-heated cabinets or boxes, and they receive the compound through a pipe that opens into the end of that part of the sieve framework that is stationary. This arrangement admits of loading the sieves while revolving. The material with which the framework of this sifter is covered and which accomplishes the separation of dirt, sand, splinters, string, paper, &c., from the compound, is of silk, or, preferably, of from 70 to 90-mesh brass cloth, it being more durable and just as effective. Silk has a tendency to split and scatter the sieved refuse into the cleaned material. Even brass net is liable to crack where it is pressed continuously against

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the sharp edge of the framework. This effect can be reduced to a minimum by superimposing strong cloth in the form of a narrow strip between the frame and the wire cloth.

These appliances require for their successful operation the human equation in the shape of a reliable workman who will keep the sieves in repair, for they are under continuous strain and liable to be damaged by the very refuse they hold.

Compounds thus dried and cleaned are ready for combination with rubber to compose what will eventually become insulation. It will be seen that great pains are taken to render the material entering into an insulation compound fit for its delicate and important functions.

OUR LEGAL QUERY COLUMN.

[*Questions addressed to this column should be written on one side of the paper only.*]

"Contractor" writes:—"About nine months ago a smartly-dressed man called on me, saying that an hotel proprietress (a customer of mine) had referred him to me for assistance. He had an illuminated advertising disk, and brought several local firms' representatives to see the article illuminated on my premises. He hung about for about four days, and then cleared off, leaving all his apparatus in my shop, and also omitting to pay his hotel bill. I do not know whom he represented, and I want the things left on my premises out of the way. Am I entitled to sell them and retain the money for storage? If anyone can describe the apparatus as belonging to them, I am prepared to correspond with them through you."

*** We gather that "Contractor" has no knowledge whatever of the whereabouts of his mysterious friend. Strictly speaking, before the right to sell for the purpose of covering warehousing charges is exercised, some kind of notice should be given. It would be prudent to advertise the fact that the articles in question will be sold. As the address is unknown, an advertisement might be inserted in a newspaper. After that, "Contractor" might sell with an easy conscience.

NEW PATENTS APPLIED FOR, 1908.

Compiled expressly for this journal by W. P. Thompson & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

16,384. "Telephone mouthpiece disinfector." L. P. Watts. August 4th.

16,399. "Improvements in and relating to primary and secondary electric cells." A. M. Kohler. August 4th.

16,410. "Improvements in electrical controlling and indicating attachment to engines, dynamos, electric or other motors." J. W. H. Trotman. August 4th.

16,415. "Preventing accidents to life and property caused by the falling of aerial wires carrying high-tension electrical currents." D. P. F. Ghadiali. August 4th.

16,446. "Improvements in electric telegraphs particularly applicable to fire alarms." Siemens & Halske Akt. Ges. (Date applied for under Sec. 91 of the Act, August 5th, 1907, being date of application in Germany.) August 4th. (Complete.)

16,449. "Improvements in or relating to electrical conductors." H. M. Chapman. August 4th.

16,462. "Improvements in or relating to electric telegraphy." P. P. O'Neil. August 4th.

16,473. "Improvements in and relating to boosters for train lighting systems and the like." W. Stansfield and J. J. Hall. August 5th.

16,483. "Improvements in telegraph and telephone pole-arms." R. W. Lewis. August 5th.

16,484. "Improvements in and in the manufacture of metallic arms of telegraph and telephone poles." R. W. Lewis. August 5th.

16,491. "Improvements in and relating to the electrical propulsion of ships." Siemens Bros. Dynamo Works, Ltd., and M. Kloss. August 5th. (Complete.)

16,493. "The utilisation of the high-tension electric spark for permanent and indelible writing without ink." D. P. F. Ghadiali. August 5th.

16,496. "Improvements in electric water heaters." O. H. Fiddes and H. A. Snipke. (Date applied for under Sec. 91 of the Act, December 18th, 1907, being date of application in United States.) August 5th. (Complete.)

16,529. "Improvements in storage batteries." J. Bimeler. August 5th. (Complete.)

16,534. "Improvements in and relating to the manufacture of refractory electric conductors." W. D. Coolidge. (Date applied for under Sec. 91 of the Act, August 7th, 1907, being date of application in United States.) August 5th. (Complete.)

16,535. "Improvements in and relating to electrical condensers." G. E. Gaiffe. (Date applied for under Sec. 91 of the Act, February 8th, 1908, being date of application in France.) August 5th. (Complete.)

16,538. "Improvements in or relating to electrolytic processes for covering silver-plated surfaces of glasses or mirrors with a protective metal layer and apparatus therefor." J. H. Monge and C. Arzano. (Date applied for under Rule 13, August 12th, 1907. An invention comprised in application No. 18,210, dated August 12th, 1907.) August 5th. (Complete.)

16,539. "Improvements in or relating to electrolytic processes for covering silver-plated surfaces of glasses or mirrors with a protective metal layer and apparatus therefor." J. H. Monge and C. Arzano. (Date applied for under Rule 13, August 12th, 1907. An invention comprised in application No. 18,210, dated August 12th, 1907.) August 5th. (Complete.)

16,546. "Improvements in apparatus for wireless telegraphy." G. Marconi and Marconi's Wireless Telegraph Co., Ltd. August 5th.

16,562. "Improvements in the construction of regulating or resistance switches, motor-starters and the like." F. W. Andrews. August 6th.

16,563. "Apparatus for holding in position without hands telephone receiver when in use." J. Robinson and W. J. Pallister. August 6th.

16,583. "Method of and apparatus for electrical separation." W. Fairweather. (Huff Elektrostatic Separator Co., United States.) August 6th. (Complete.)

16,597. "Improvements in or relating to portable electro-magnets." W. A. Thier. August 6th.

16,621. "Improvements in and relating to the control of electric motors." British Thomson-Houston Co., Ltd. (Allgemeine Elektricitäts Gesellschaft, Germany.) August 6th. (Complete.)

16,658. "Improvements in or relating to electro-magnetic apparatus." H. M. Chapman. August 7th.

16,695. "Improvements in or relating to electric incandescent lamps." Cutler, Wardle & Co., Ltd., and W. Wardle. August 8th.

16,701. "Electro-magnetic motor and time switch, with adaptability for actuating clockwork and the like." F. C. Webber. August 8th. (Complete.)

16,704. "Improvements in and relating to dynamo-electric machinery." C. A. Parsons and A. H. Law. August 8th.

16,722. "Improvements in arc control mechanisms for projectors, searchlights and the like." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) August 8th.

16,737. "New substances to be used as varnishes and for impregnation and insulation, and method for their production." G. G Diesser. August 8th. (Complete.)

PUBLISHED SPECIFICATIONS.

Copies of any of these Specifications may be obtained of Messrs. W. P. Thompson & Co., 322, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1907.

Magneto Machines chiefly for the Ignition of Internal Combustion Engines. J. D. Bell. 20,919. September 20th.

Anti-Vibration Device for the Electric Lamps of Automobiles, Carriages and the like. J. Oldfield and R. A. Oldfield. 21,127. September 20th.

Control of Electric Motors. J. S. Raworth and A. B. Raworth. 21,363. September 26th.

Metal-Cored Flame Carbons for Electric Arc Lamps. M. Railing, M. Solomon and H. E. Crocker. 23,116. October 19th.

Magneto-Electric Machines and Pole Armatures. Hartmann & Braun Akt.-Ges. 23,318. October 22nd. (Date applied for under International Convention, October 24th, 1906.)

Electrically-Controlled Compasses. Siemens Bros. & Co. 23,768. October 28th.

Life-Guard for Electric Tramcars, Motor-Cars, Motor Omnibuses and other Power-Propelled Vehicles. P. Bisset. 26,313. November 28th.

Electric Motor-Generators. Mather & Platt, Ltd. (E. Rosenberg.) 28,530. December 28th.

Electrical Ignition Devices. C. Ebner. 28,738. December 31st.

Switch Mechanism for Controlling Electric Motors. British Thomson-Houston Co. (Allgemeine Elektricitäts Ges.) 11,070. May 11th.

Induction Motors and Method of Starting, Connecting Up and Controlling the Speed of Combinations of such Motors Operated from a Single-Phase Supply. J. L. la Cour. 15,834. July 10th.

Means for Electrically-Operating Tramway and like Points or Switches from Passing Vehicles. P. Rojcsik. 16,252. July 15th.

Method of and Means for Applying Insulating Material to Electric Cables, Parts of Electric Generators or Motors, and the like. H. McPhail. 16,372. July 16th.

Devices for Making and Breaking Electric Contacts. F. H. Varley. 16,461. July 8th.

Method of Attaching Tungsten Filaments in Electric Glow Lamps. Deutsche Gasglühlicht Akt.-Ges. 16,503. July 18th. (Date applied for under International Convention, May 6th, 1907.)

Electrically-Propelled Vehicle. H. P. Schreiber. 16,600. July 19th.

Switches for Electric Bells. G. Harding. 17,584. August 1st.

Controlling Devices for Electric Circuits. British Thomson-Houston Co. (General Electric Co., United States.) 18,022. August 8th.

Means for Working or Controlling Illumination of Electric Lamps or Signs. J. Cole. 18,578. August 16th.

Conduits for Electric Wiring. H. Pendlebury, A. Pendlebury and H. Pendlebury. 19,118. August 26th.

Electric Lampholder with Shade-Carrier Holder for Bayonet Cap Electric Lamps. C. M. Escaré and C. Damey. 20,619. September 17th.

Switches, Relays, Measuring Instruments and the like for Use in Electric Circuits. Siemens Bros. Dynamo Works, Ltd. 21,174. September 24th.

Electrically-Heated Apparatus for Vulcanising Tires or Tire Tubes. W. H. Welch and Harvey Frost & Co. 21,332. September 26th.

Magnetos and Connections Therefor in Explosion Engines. E. Denieport. 21,699. October 1st.

Arc Lamps. D. Timar and K. von Dreger. 23,043. October 18th.

Electric Switches. E. B. Boucher and T. A. Mitchell. 23,322. October 27th.

Means for Generating Direct Current of Limited Strength. Felten and Guilleaume Lahmeyerwerke Akt.-Ges. 23,880. October 29th. (Date applied for under International Convention, October 31st, 1906.)

Systems of Electric Distribution. British Thomson-Houston Co. (General Electric Co., United States.) 24,231. November 1st.

Apparatus for Recording Bell or like Signals, Specially Applicable to Mines. J. Russell and J. H. Milligan. 24,387. November 4th.

Speed Controlling Apparatus for Electric Motors. Siemens Bros. Dynamo Works, Ltd. (Siemens Schuckertwerke Ges.) 26,404. November 29th.

Starting Switch Sets or Arrangements for Polyphase Motors. Siemens Bros. Dynamo Works, Ltd., and R. A. R. Bolton. 26,797. December 4th.

1908.

Dynamo-Electric Machines of the Commutator Type. Allgemeine Elecricitats Ges. 10,121. May 9th. (Date applied for under International Convention, September 30th, 1907.)

Manufacture of Metal Electric Lamp Filaments Free from Carbon. Siemens & Halske Akt.-Ges. 11,524. May 27th. (Date applied for under International Convention, June 8th, 1907.)

Automatic Stopping Devices for Electric Lifts or Hoists. Siemens Bros. Dynamo Works, Ltd., and A. S. Cliff. 877. January 14th.

Means of Stopping the Electric or Spring Motors of Gramaphones and the like at the End of the Reproduction. G. H. Bassano. 1,799. January 27th.

Magneto Generators. L. le Pontois. 2,404. February 3rd.

Means of Coupling Electrical Conduits. Barton & Sons, Ltd., A. Barton and A. J. Harper. 5,950. March 17th.

Process for Hardening Tantalum. Siemens & Halske Akt.-Ges. 6,051. March 18th. (Date applied for under International Convention, March 26th, 1907.)

Electric Arc Lamps for Theatrical and other Stages. T. J. Digby. 6,229. March 20th.